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THE FOUNDRY

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Trade Outlook.

It is surprising that in spite of extensive labor troubles, principally among the machinists, a trade which is closely allied to the foundry, there has been no material interruption of trade. It is of course impossible for the foundries to keep on piling up castings unless there are machinists to finish them, but taking it altogether the foundries have not suffered as much from lack of work as could be expected under the circumstances.

On all sides regrets are heard that the unusual activity enjoyed by all lines of manufacture should be interfered with by strikes, lockouts and the like. There has been some un-American talk indulged in by both parties, when a conciliatory spirit would have been much more in place and tended to shorten the breach, which stubbornness alone can never accomplish.

In certain quarters the molders are showing a disposition to act in conjunction with workers in other lines, and this to some extent complicates the outlook.

Rogers, Brown & Co. say in a recent review of the market: "The pig iron market shows improvement and the smaller buyers are making inquiries for quantities ranging from car lots to 500 tons. The rolling mills are also placing orders for their immediate requirements. It is reported that the leading interest has bought all the spot Bessemer in the valleys and is figuring on large quantities of both Bessemer and basic for the last half of the year. A large purchase by said buyers would make the feeling among the producers more optimistic than they have been during the past month. Stocks are still decreasing. They have dropped from 633,039 tons on February 1 to 416,070 tons on June 1, which represents less than ten days' production. The weak spot in the present market is in Southern foundry irons, which present a range of prices indicating difference of opinion as to the strength of the midsummer market. The crop reports from the corn and wheat producing sections indicate large yields which promise increased revenues for all concerned and will doubtless stimulate the demand for agricultural machinery which at present is an active factor in the iron consumption."

Matthew Addy & Co. say: "There has been a decidedly better tone to business during the past few days. The general impression that there would be no considerable buying of pig iron until the present labor troubles were settled has been shown to be unfounded for there has been a lively demand. This has come from a number of the larger consumers who have placed orders for from 2,000 down to 500 tons for practically prompt shipment. There has been in addition the regular purchasing of car load lots for rush shipment. This car load buying has been a great feature of recent trading. In itself it has amounted to a fair tonnage, yet with the larger orders added to it the business of the week has been very satisfactory. The buying is not over yet by any means, as some excellent inquiries are now on the market for pipe, foundry and mill irons. Should half of these inquiries be turned into actual orders June would turn out to be a

quite respectable month. There is some diversity as to prices owing to different views held by iron masters both in the North and South, but the publication of the May statistics showing a heavy reduction in stocks has already tended to steady the situation. It is becoming apparent that the strikes have not had the serious effect on consumption that was at first feared. Consumers themselves are short of iron, having, as far as we can learn, none in stock. It is surprising how close in this regard some large concerns are running. A delay of a day or two in shipping has caused several of them to temporarily shut down. Altogether the prospect is much more encouraging than it has been for some time."

More Consolidations.

This year is remarkable for the large number of consolidations, effected or proposed, which indirectly touch the foundry business. The United States Shipbuilding Co., with a capital of $65,000,000 is one of the latest moves to bring a number of plants, having a common interest, under one management. The plants it is proposed to acquire include the Newport News Shipbuilding & Dry Dock Co., Newport News, Va.; the Union Iron Works, San Francisco, Cal.; the Bath Iron Works, Limited, and the Hyde Windlass Co., Bath, Maine; the Crescent Ship Yard and the Samuel L. Moore & Sons Co., Elizabethport, N. J., and the Canda Mfg. Co., Carteret, N. J.

Plans are also being prepared for at least a working agreement, if not actual consolidation, among several of the leading stationary engine builders. The locomotive builders have pooled their interests and the American Locomotive Co. has been formed. It is a consolidation of leading locomotive companies in the country except the Baldwin Locomotive Works. It is capitalized at $50,000,000. The following companies are included: Brooks Locomotive Works, Dunkirk, N. Y.; Cooke Locomotive Works, Paterson, N. J.; Manchester Locomotive Works, Manchester, N. H.; Pittsburg Locomotive and Car Works, Pittsburg; Rhode Island Locomotive Works, Providence, R. I.; Richmond Locomotive Works, Richmond, Va., and Schenectady Locomotive Works, Schenectady, N. Y. S. R. Callaway, president of the New York Central and Hudson River Railroad Co., has resigned that office to accept the presidency of the new American Locomotive Co.

The agricultural implement manufacturers are also said to favor a closer community of interests and according to the *Farm Implement News* of Chicago, the following list embraces the concerns which have given options to the promoters of the consolidation. In all cases except that of the Moline Plow Co., the options have been given direct. The Moline option is in the hands of a third party: Deere & Co., Moline, Ill.; Deere & Mansur Co., Moline, Ill.; Moline Plow Co., Moline, Ill.; Grand Detour Plow Co., Dixon, Ill.; Rock Island Plow Co., Rock Island, Ill.; Morrison Mfg. Co., Fort Madison, Iowa; David Bradley Mfg. Co., Bradley, Ill.; B. F. Avery & Sons, Louisville, Ky.; Bucher & Gibbs Plow Co., Canton, Ohio; Syracuse Chilled Plow Co., Syracuse, N. Y.; South Bend Chilled Plow Co., South Bend, Ind.; Fuller & Johnson Mfg. Co., Madison, Wis.; Kingman Plow Co., Peoria, Ill.; Pekin Plow Co., Pekin, Ill.; Peru Plow & Wheel Co., Peru, Ill.; Sattley Mfg. Co., Springfield, Ill.; J. Thompson & Sons Mfg. Co., Beloit, Wis.; Minneapolis Plow Works, Minneapolis, Minn.; Union Malleable Iron Co., Moline, Ill.; Bettendorf Metal Wheel Co., Davenport, Iowa.

Two Explosions.

Twelve men were injured in a terrific explosion of gas in the Delaware and Hudson company's iron foundry at Scranton, Pa. Gas generated by melting iron accumulated in one of the stacks and exploded with tremendous force. The foundry was completely demolished and all the window-glass within a radius of half a mile was smashed.—Philadelphia North American.

An explosion in the melting furnace at the Woodruff & Edward foundry for a few moments threatened the plant with destruction by fire. The flames, however, were quickly extinguished and the damage was practically nothing. The explosion was caused by gas. Burning coke was hurled up the iron smokestack and redhot chunks were scattered in every direction upon the gravelled roof. Explosions in furnaces of the kind used at this plant are very rare. In this instance it was doubtless caused by the coke and iron forming an obstruction to the free passage of the gases. No damage was done to the furnace.—Elgin (Ill.) Courier.

Lose confidence in yourself and you become a failure—the swimmer who expects to go to the bottom generally gets there.

The Buffalo Convention.

The sixth annual convention, or what is more popularly known as the Buffalo convention, of American Foundrymen has passed into history. It was a very successful meeting, a large amount of business being transacted without a hitch of any kind. Great credit is due the secretary of the association, Dr. Richard Moldenke, for the complete facilities provided for carrying on the work of the convention.

The business sessions were held in the hall of the 74th Regiment, N. Y. N. G. Armory, a short distance from the Niagara Hotel, the general headquarters of the association. The delegates arrived early on the scene, doubtless influenced in doing so by the presence of the exposition, which many visited Monday, the day previous to the opening of the convention. The registration was in charge of S. W. Spear, of the East Buffalo Iron Works, secretary of the Buffalo Foundrymen's Association and chairman of the press committee, who worked untiringly to make the visitors comfortable.

Tuesday Morning.

W. A. Jones, of Chicago, president of the Association, called the convention to order and introduced Mr. O. P. Letchworth, of the Pratt & Letchworth Co., Buffalo, whose popularity among foundrymen everywhere is unlimited. Mr. Letchworth's close connection with the National Founders' Association has made him a familiar figure wherever foundrymen congregate, as was shown in the enthusiasm with which he was received.

Mr. Letchworth in his address of welcome on behalf of the Buffalo Merchants' Exchange, of which he is president, and the Buffalo Board of Trade, extended to those present the cordiality of the city. In the course of his remarks the speaker touched upon the strained relations between capital and labor, in all sections of the country at the present time, and he deplored the stand taken by certain labor leaders which he predicted, if persisted in, will result in great injury to the country's greatest interests. He concluded: "I have great faith, however, and am very confident also that the future has better things in store for us. I have great confidence in the belief that the more intelligent and conservative representatives of labor appreciate the gravity of the situation and that they are anxious and desirous to take such steps as may possibly prevent more strained and more difficult relations than now exist. I also have great faith and great confidence in the forbearance, intelligence, the charity, the good sense and the level headedness of the business men of this country."

Mr. C. S. Bell responded appropriately to the remarks of Mr. Letchworth, thanking him on behalf of the association.

President's Address.

President Jones then read his report for the year, which was heartily received by the delegates. He referred to the prosperous period of the past year and regretted that it should now be marked by serious labor disturbances in many trades.

Continuing Mr. Jones spoke of the educational value of the American Foundrymen's Association, and the results it had accomplished directly and indirectly since its formation. While the association had not received the universal support from foundrymen to which it is entitled, the speaker believed this would be changed as soon as its value became better known. Mr. Jones paid a high tribute to the work accomplished by Secretary Dr. Moldenke, in behalf of the association and the excellent results attained thereby.

Secretary's Report.

In presenting his report Dr. Richard Moldenke said:

"Established five years ago on the general belief that it would be a good thing for foundrymen to get together, the Association came to life in a period when methods began to change partly through the exigencies of the hardest times this country has ever passed through, and then again by reason of rapid developments to be credited to our investigators. The result was a plenty of foundry practice to be discussed by those who were anxious to keep in the front rank as producers, and conventions, the main features of which were drifting to the incidental entertainment. Gradually, however, matters of daily practice were fairly well discussed, and the achievements of the 'industrial engineer' in lines other than ours beginning to be felt most uncomfortably by those of us who supply the enormous tonnage he consumes, attention was perforce turned to the subject of rapid production of castings at selling prices far below anything we had ever known. From then on the questions of stand-

ardization so ably foreseen and provided for in our constitution were taken up and thus a purpose given our deliberations which promised to be of most far reaching consequence. Our members will no longer scan the programs so much for the charming courtesies of our generous hosts, but will look for the sober business which may mean so much in their future commercial relations.

"As a remarkable corroboration of these statements it may be added that correspondence with practically all writers on foundry topics has developed the fact that our most practical foundry managers are studying foundry science deeply and make daily application of it in their own works. Throughout the year it has been the aim of your secretary to obtain papers relating to points of practice in the foundry, but the results show that either the subject is already too well threshed out, or that the newer foundry methods are monopolizing almost everybody's attention. In any case our members were not the losers, and the range of foundry thought was pretty evenly covered, as may be seen in our publications."

Dr. Moldenke then reviewed the financial affairs of the Association, the membership now numbering 297, and gave the members a short account of the work accomplished through correspondence and the Association JOURNAL, which is intended to be a compendium of contemporary foundry literature, much upon the plan of the Journal of the Iron and Steel Institute of Great Britain. Continuing, Dr. Moldenke touched upon the necessity of a better technical education for our foundry managers in the following words:

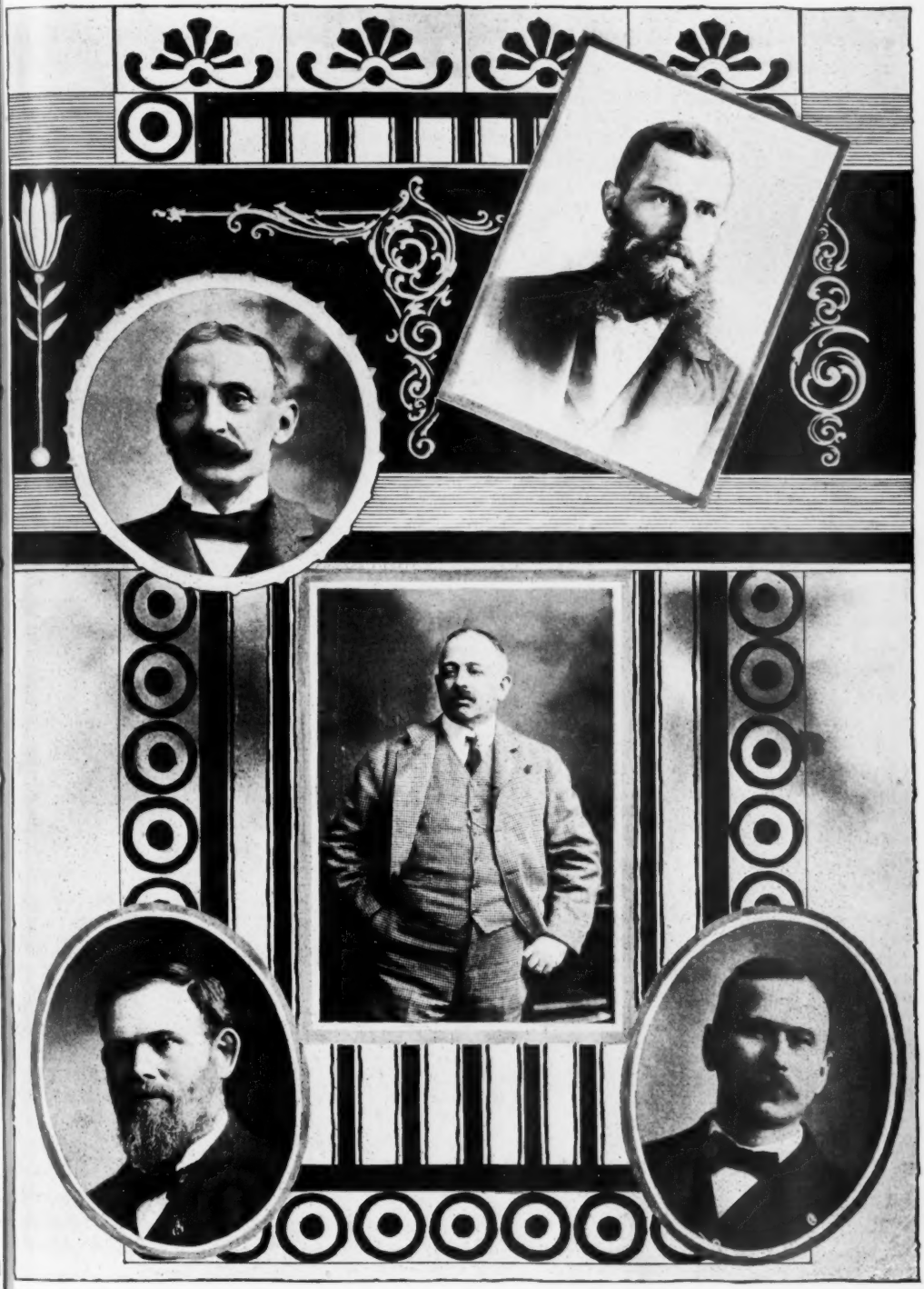
"In accordance with the resolution concerning the better training of our future foundry managers, passed at the last convention, your secretary begs to report that this matter was taken up by correspondence with practically all our institutions of learning which devoted some attention to technical education. With only one exception replies were received, and these indicated the serious thought given to the problem. Indeed the establishment of a department for foundry theory and practice has been strongly recommended in the case of the Carnegie Technical School. A very extended series of letters was the result, for many of our universities wished to know in what way they could aid our industry. The consensus of opinion seems to be that pending special equipment for the purpose instruction should be given in foundry practice by lecture and regular visits to the more advanced foundries of the respective districts. Summer classes should be formed for the students who wished to make this their life work, or they should become volunteers in order to learn what they can of the practical operations of foundry procedure. Once the foundry becomes the desirable field for technical students it should, and the institutions for learning are enabled to add foundry apparatus to their equipment, plenty of use will be found for it, not only for teaching the various branches of the industry, but for advanced investigation, and consequent benefit to the students as well as ourselves. We sincerely hope this agitation in teaching circles may go on, and feel that as our requirements become better known thereby the solutions will suggest themselves in the natural course of events.

"In obedience to a request for information relative to the melting loss in the cupola process your secretary distributed suitable blank sheets of inquiry and is still receiving returns. The amount of interest created is most gratifying, replies having come even from Europe, and those of our foundrymen who may still wish to help obtain this information of such importance to the trade are requested to communicate with the secretary. It is hoped that a synopsis and study of these memoranda can be presented early in the fall.

"From the numerous requests for specifications for gray iron castings received during the year, from the operating departments of great industrial corporations, the action which will be taken on the report of our committee on standardizing the testing of cast iron will be observed with much interest. Indeed, the magnitude of our industry is such that the wish has been repeatedly expressed that our Association should take up this question seriously with the International Association for Testing Materials at the coming convention in Budapest, acting through the American Section, of which we are members."

The secretary referred to the death during the year of W. H. Carpenter, of Providence, R. I., and Sylvester N. Leary, of Brooklyn, N. Y., also to the recent demise of Capt. Henning, of Berlin, Germany, who was one of the most ardent advocates of progress among the German foundrymen.

At this juncture the presence of Howard Evans, treasurer of the Association, became known, and although Mr. Evans had been absent from the three previous conventions on account of sickness, it soon became evident that



SOME PROMINENT FACES SEEN AT THE CONVENTION.

SAM. W. SPEAR. O. P. LETCHWORTH. RICHARD MOLDENKE.

W. A. JONES. H. W. WENDT.

this had not in the least affected his popularity with the members, and amid general applause he was escorted to the speakers' stand.

Report of Standardizing Bureau.

Thos. D. West, chairman of the bureau, said in part:

"While the Association's standardized drillings have served their end in a most valuable way, there still remains other work in the same direction, and the time seems now ripe for some definite action on the next step. We refer to the instructions received by your committee at the Pittsburg Convention, two years ago, to learn if anything might be done toward the specification of uniform methods in making chemical determinations. This matter was taken up at that time and has been more or less continually agitated by your committee, but action was postponed in order to let the iron chemists get more in touch with each other after using the standard drillings to check up their various methods, and realizing the benefits of uniformity in action.

"This is now universally recognized, and there appears to be a desire on the part of many foundry, furnace and pig iron men, as well as chemists to have the work of selecting uniform methods for making analyses pushed ahead as rapidly as possible.

"Your committee has been approached so frequently of late on this subject that upon the formal request of Mr. J. O. Henshaw, of N. S. Bartlett & Co., they beg to recommend to the Association that a special committee to represent the interests of the foundry, furnace and chemist be appointed to proceed with this work with a view of presenting a set of standard methods for determining the constituents of pig and cast iron upon which these materials can be bought and sold."

On motion of Dr. Moldenke the president was authorized to appoint a committee of three to investigate uniform methods of making chemical analyses of pig and cast iron.

Standardizing the Testing of Cast Iron.

This committee composed of Thos. D. West, James S. Stirling, J. S. Seaman, Jos. S. McDonald and Dr. Moldenke, made a report which is in part as follows:

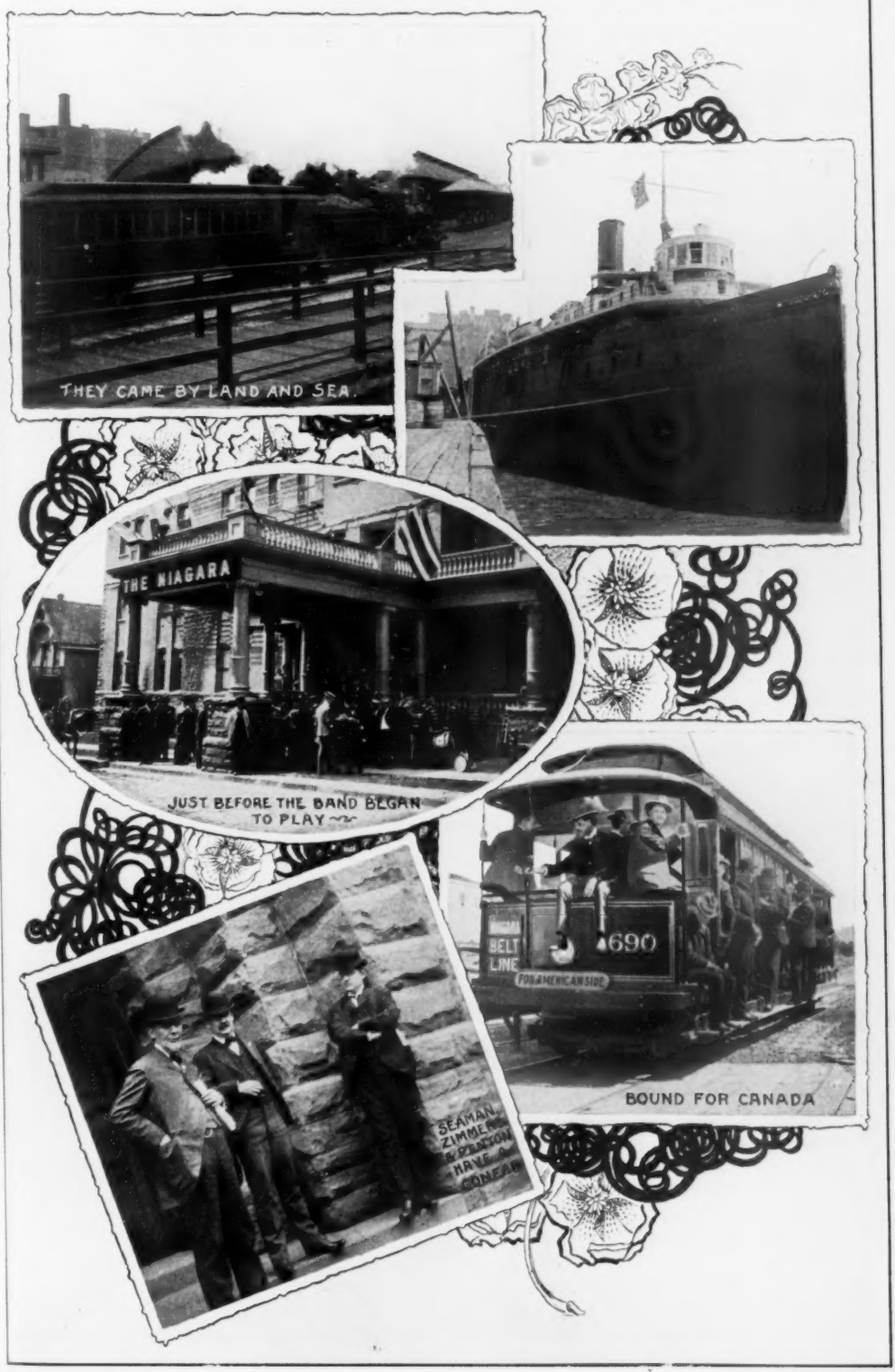
Your committee desires to state that during the past year sufficient work has been done to warrant a final report based upon the results obtained and the conclusions derived therefrom. We must, therefore, beg that our report be received and our committee on standardizing the testing of cast iron be discharged; and we beg further that permission be granted to the individual members of our committee to utilize the mass of material collected, for further investigations of interest to the foundry trade and the publication of such results as part of the proceedings of this Association.

Since our last convention there have been made 555 tests, many of which were kindly performed by H. E. Diller, of Pittsburg, Pa., making the sum total for the complete work 1601 tests made on 1229 test bars, not counting the chill pieces and fluidity strips, the whole material handled weighing, roughly, 15 tons.

There is considerable detail still remaining in the way of tabulations and critical studies of our series of tests made in all the distinctive classes of cast iron. The results we have obtained have been thoroughly discussed by us, and are summarized in the following:

There are two methods of judging the physical quality of castings. 1. In the abstract—judging the quality of the iron entering into them; this leaves out the elements of uncertainty introduced by the things which happen after pouring. 2. In particular—the quality of the casting for the purpose intended. This can only be ascertained by testing the casting itself, or at least the representatives of a given lot. This latter method, of greatest importance to the buying element, will likely always be studied and specified by them, and cannot therefore be well taken up by our foundrymen on the initiative. Car wheels, car couplers, boiler castings, pipe, etc., are among the numerous things now bought regularly under specifications which insure good results, the tests being made on the castings themselves. As these particular instances, however, will always remain the great minority of the foundry product, the method of testing which will most concern us is that which judges the iron entering into the molds.

Throughout the whole line of operations only regularly constituted mixtures were used, the balance of the heats from which these test bars were cast going directly into commercial castings of the classes designated. The results are therefore entirely comparable with daily practice, and are not exceptional cases prepared specially for a good showing. For purposes of comparison green sand and dry sand bars were made side by side even though the iron in practice goes into only one of these classes of molds. It was felt that comparison records were wanted just as much as specifications for the


THEY CAME BY LAND AND SEA.
THE NIAGARA
JUST BEFORE THE BAND BEGAN TO PLAY
BELT LINE
690
FOR AMERICAN SIDE
BOUND FOR CANADA
SEAMAN, ZIMMERMAN & PEARSON HAVE A CONFERENCE

separate lines of product. For this reason also we recommend one standard size of test bar for comparative purposes only, each class of iron being given its special treatment for the information wanted in daily practice in addition.

Our studies on the shape of the test bar have resulted in the selection of the round form of cross section, and this mainly on the score of greatest uniformity in physical structure, the corners of the square bar introducing elements which become troublesome, especially in irons with a lower range of the silicon contents.

SIZES OF TEST BARS.

The following are the sizes of bars selected for tests as a result of our investigations:

For all tensile tests a bar turned to 0.8 inches in diameter, corresponding to a cross section of ½ square inch. Results, therefore, multiplied by two, give the tensile strength per square inch.

For transverse tests of all classes of iron for general comparison, a bar 1½ inches in diameter on supports 12 inches apart, pressure applied in middle and deflection noted. Similarly for ingot mold, light machinery, stove plate and novelty iron a 1½ inch diameter bar—that is to say, for irons running from 2 per cent. in silicon upward or from 1.75 per cent. silicon upward where but little scrap is in the mixture.

For dynamo frame, sash weight, cylinder, heavy machinery and gun metal irons, similarly a 2-inch diameter bar is recommended—that is for irons running from 1.50 to 2 per cent. in silicon, or where the silicon is lower and the proportion of scrap is rather large.

For roll irons, whether chilled or sand, and car wheel metals, a 2½-inch diameter bar is recommended—that is, for all irons below 1 per cent. silicon, and which may therefore be classed as the chilling irons.

PROPOSED STANDARD SPECIFICATIONS FOR GRAY IRON CASTINGS.

1. Unless furnace iron, dry sand or loam molding, subsequent annealing is specified, all gray iron castings are understood to be of cupola metal; mixtures, molds and methods of preparation to be fixed by the founder to secure the results by purchaser.

2. All castings shall be clean, free from flaws, cracks and excessive shrinkage. They shall conform in other respects to whatever points may be specially agreed upon.

3. When the castings themselves are to be tested to destruction, the number selected from a given lot and the tests they shall be subjected to are made a matter of special agreement between founder and purchaser.

4. Castings made under these specifications, the iron in which is to be tested for its quality, shall be represented by at least three test bars cast from the same heat.

5. These test bars shall be subjected to a transverse breaking test, the load applied at the middle with supports 12 inches apart. The breaking load and deflection shall be agreed upon specially on placing the contract, and two of these bars shall meet the requirements.

6. A tensile strength test may be added, in which case at least three bars for this purpose shall be cast with the others in the same molds respectively. The ultimate strength shall also be agreed upon specially before placing the contract, and two of the bars shall meet the requirements.

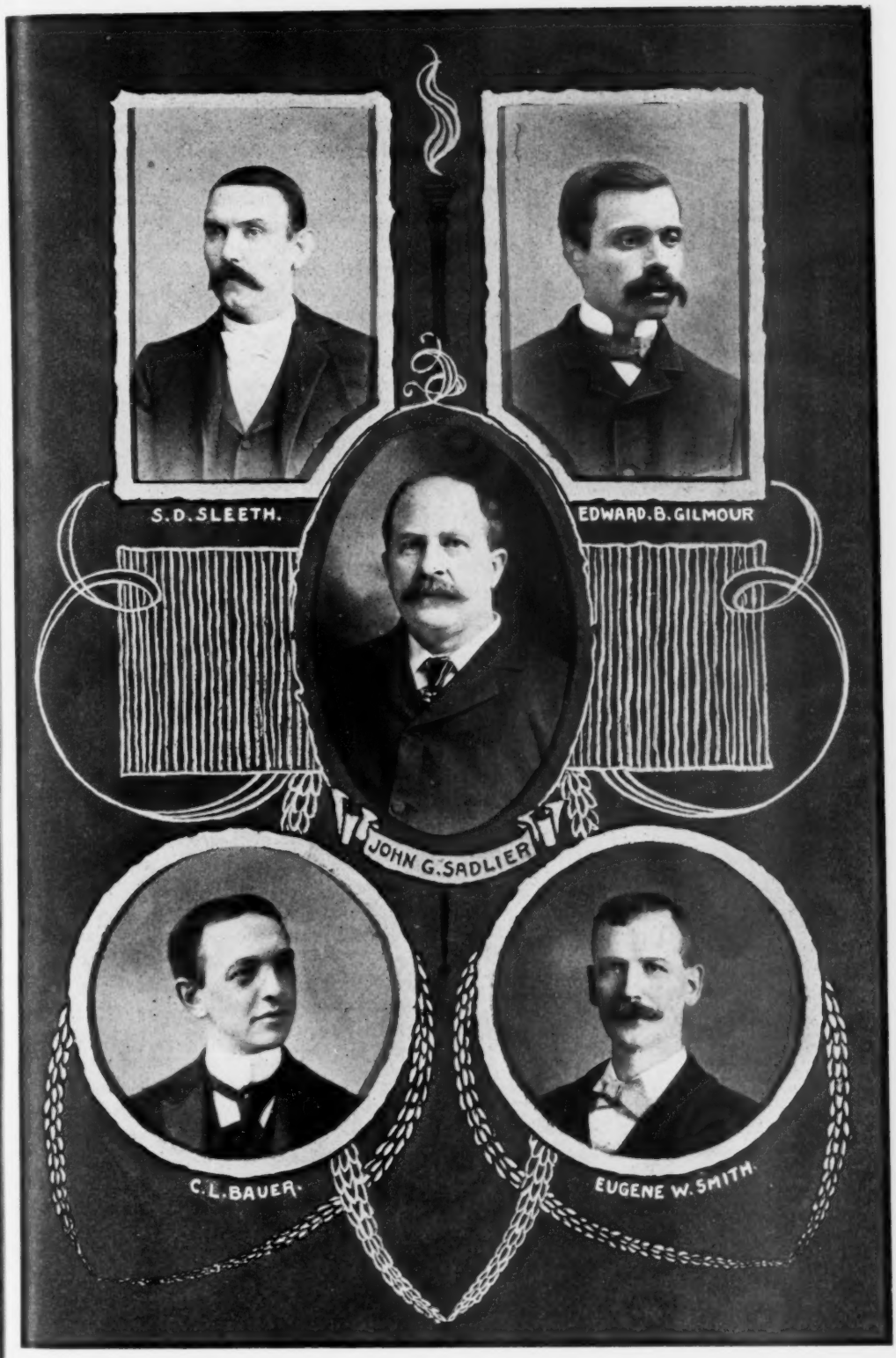
7. The dimensions of the test bars shall be as given herewith. There is only one size for the tensile bar and three for the transverse. For the light and medium weight castings the 1½-inch D bar is to be used, heavy castings the 2-inch D and chilling irons the 2½-inch D test bar.

8. Where the chemical composition of the castings is a matter of specification in addition to the physical tests borings shall be taken from all the test bars made, well mixed, and any required determination, combined carbon and graphite alone excepted, made therefrom.

9. Reasonable facilities shall be given the inspectors to satisfy themselves that castings are being made in accordance with specifications, and, if possible, tests shall be made at the place of production prior to shipments.

Tuesday Afternoon.

The afternoon session opened with an address by H. M. Ramp, superintendent of the Crescent Iron Works, of Springfield, Mo., on "Benefits of the American Foundrymen's Association as Viewed by an Outsider." The speaker referred at length to the great benefits that have accrued from the organization of foundrymen in this country and Canada, which has been beneficial not only to the foundrymen, but to the molder and shopmen as well. "It has proved," he said, "that the foundrymen must co-operate with one another to secure the best results, and cut-throat competition, which existed before the organization of this association, when each foundryman guarded his plant with the utmost care, lest some improvement he had hit upon should become known to his competitor, has received its first wound in


S. D. SLEETH.
EDWARD B. GILMOUR
JOHN G. SADLIER
C. L. BAUER.
EUGENE W. SMITH.

the organization of this association. To obtain the best results the foundryman has learned that an interchange of ideas with his competitors is a good thing. He is learning what they are doing; they are learning what he is doing, and the mutual benefits derived are too great to be measured by dollars and cents. On the other hand, the men in the foundry have also benefited. They have learned that supply and demand must regulate trade and are not rushing into strikes as heedlessly as before." Senator Ramp closed his remarks by extending an invitation to the Association to hold its convention in 1903 at St. Louis, Mo., when the exposition, which is already in progress of construction, will be held. Mr. Ramp is a fluent speaker and his remarks received close attention.

Influence of Titanium on the Properties of Cast Iron.

BY AUGUSTE G. ROSSI, NEW YORK.

This was the first paper read at the convention. It is in part as follows:

Titanium is a very common constituent of iron ores. When below 1 per cent. it is usually ignored. When, however, the titanium oxide runs from 10 to 40 per cent. or over, the ores may be legitimately called "titaniferous" iron ores, and these occur in mountain masses in several states. Usually free from sulphur, and particularly phosphorus, and low in silicon, they form excellent stock to mix with soft ores.

We have positive statements on the influence of titanium on cast iron which show that it is favorable, be the action itself a direct one by alloying, or indirect by the removal of deleterious influences. My own experience in producing several hundred tons of pig iron of this nature from ores running 14 per cent. titanic acid, 59 per cent. metallic iron, 1.5 silicon, .017 phosphorus, and .025 sulphur, may be of interest as bearing directly upon our subject.

The analysis of this pig iron is as follows:

Silicon	0.12	0.174	0.36	0.17
Manganese	0.08	0.232	0.07	0.25
Titanium	0.07	0.183	0.24	0.05
Combined carbon	1.35	3.070	2.95	3.09
Graphite	0.14	0.327	0.24	0.255
Phosphorus	traces	0.024	traces	0.03
Sulphur	0.059	.....	0.045	0.022

This iron, an ideal stock for open hearth, was very strong; it could almost be forged cold and proved very valuable in car wheel mixtures. Added to foundry iron it increased the tensile strength considerably and is said to have retarded the solidification of the metal in the molds materially. Twenty-five per cent. to thirty per cent. of this iron in admixture with others cast in chills could not be touched by chrome steel drills, and reamers for the hubs of car wheels made of this mixture, and subjected to the most trying conditions, were found in good order after one year's service. Test bars with 25 per cent. of this titanic pig iron 1 inch by 1 inch by 12 inches between supports broke at 3,480 pounds, and cast on 1½ inch by 1½ inch by 2 inches chill blocks gave a chill 1.62 inches deep. The original metal had a transverse strength of 3,390 pounds and chilled 1.06 inches. The addition of 5 per cent. of the pig similarly gave 3,778 pounds and a chill of 1.37 inches, while the pig itself gave 2,750 pounds and was chilled throughout.

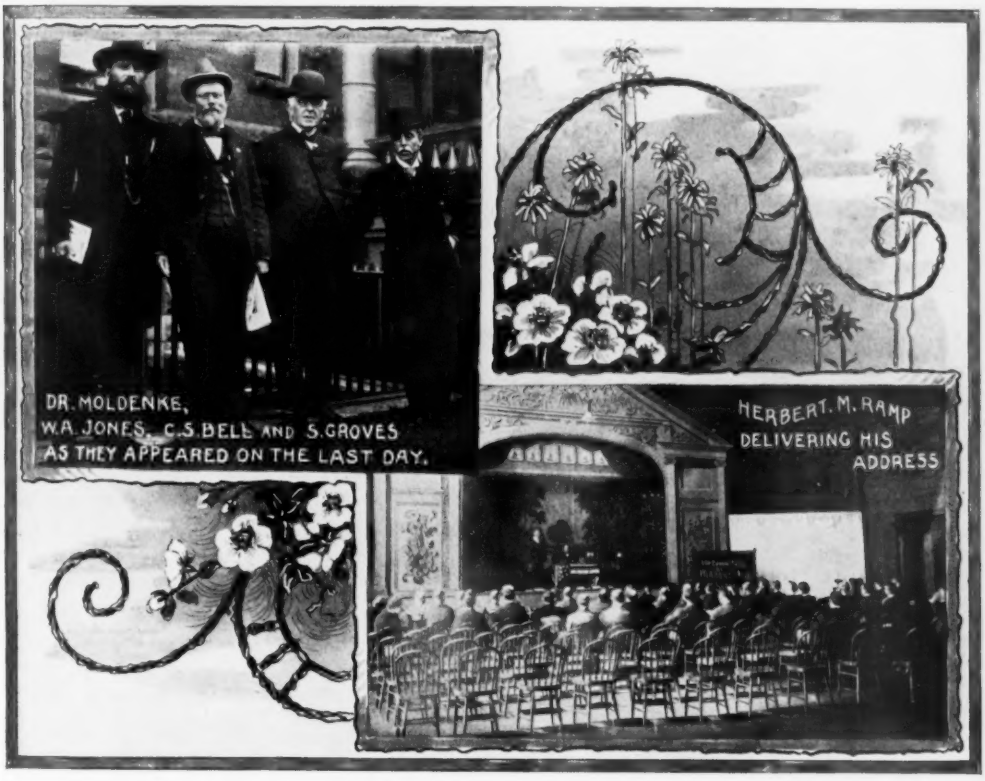
Titanic acid is not reduced directly by carbon at the temperatures prevailing in the blast furnaces, and the small percentages we find in pig irons are the result of other combined influences. The use of such pig irons in quantity in our mixtures does not, therefore, introduce anything but traces of titanium into the castings, but a beneficial result is nevertheless obtained. The properties of the titanic pig suggest its use for crushers and machinery in which substances of great hardness are to be pulverized. Manganese steel, while tough, flows too easily, and whenever it has yielded under strain it sets. By the judicious use of 10 to 20 per cent. or more titanium alloys a material of sufficient hardness and strength might be produced which would withstand the severe usage this class of machinery is subjected to.

Titanium alloys are light, becoming more so as the percentage of titanium rises, the specific gravity of this element being only about 5. The melting point also goes up as the titanium contents rises. The tests so far made have all been by additions to the iron while in the ladle or in the crucibles. No direct charging in the cupola has so far been attempted. Test bars were always made, giving the iron before and after the additions, so that a fair comparison would be possible. It is necessary to break the alloy into small pieces in order to get a complete incorporation with the iron in the ladles, and if preheated the results will be even better. In crucible work it can naturally be added in any shape desired, as the whole charge is made up before melting.

The general conclusions derived are that a 4 per cent. addition of a 10 to 12 per cent. titanium alloy is most effective for the improvement of the castings made. It is also confidently believed that the alloy can be made cheap enough to allow a 4 per cent. addition to be made without affecting the cost of the castings seriously, for the benefits derived are such that

expensive irons can easily be cut out or at least reduced to smaller amounts in a given mixture.

While investigations seem to show that the action of titanium, so far as the improvement of the castings is concerned, is a direct one, yet there may be some indirect effects involved. For instance, there may be occluded gases, such as nitrogen or oxides and nitrides of iron, which prevent the intimate contact of the crystals so necessary for strength removed. This action of titanium has been long suspected, as the metal titanium not only unites readily with



nitrogen, but actually burns in it. In any case the analyses before and after using show practically the same composition so far as silicon, the carbons and other constituents are concerned, except for the titanium found in the pig iron originally. This would show the value of titanium on the admittedly poor irons and open a field for them which would dispose of much stock now sacrificed.

The question of expense is really not so serious as it looks, for the improvement effected justifies an extra outlay. Thus chromium costs about $1.00 a pound, nickel 35c, tungsten 90c, and even $2.00 a pound is paid for molybdenum. Yet all these metals are used extensively in steel making and in percentages ranging from 3 to 10 per cent. to be of use.

The same remarks hold good for cast iron. For steam and water pipes, gate and steam valves, steam fittings in general, working under the great pressures now required for large steam cylinders, fly wheels and many other purposes where a greater tensile strength is a desideratum, these alloys could find an excellent application.

Car wheel materials have special requirements to fulfill which necessitate a careful choice of the materials entering in the mixture. If, by the addition of the alloy, the use of cheaper materials becomes admissible, even thus realizing superior results to those now obtained, such addition not only may not increase the first cost, but actually lower it. Certain railroads which require the "thermal test" are even willing to pay extra for the best results. In this particular line there is a still more important consideration. It appears that, with the new pressed steel cars, which have a capacity of 100 000 pounds, as against some 50,000

pounds, as formerly, the pressure on the wheels becomes so great that the tire "actually disintegrates under the strain and that wheels guaranteed to furnish a 5 years' service and excellent otherwise, will not stand a run of 10,000 miles, or less than one year's service. The demand for a stronger material is imperative here, and the question of cost has lost much of its importance. Would not this case (which is only one example amongst many other applications of the same kind which could be given) show that the use of titanium, which secures a considerably increased tensile strength in the body of the wheel and a greater strength and hardness of chill on the tire, can be particularly well adapted, even were it to cause a slight extra expense?

We have already mentioned the possible applications of the alloy for mixtures for crushers of all kinds. Assuming the increase in tensile and transverse strength to be as observed in the experiments recorded or 25 to 30 per cent., does not such an improvement admit of the possibility of diminishing the thickness and weight of castings which are not necessarily required to stand special or severe strains. Cannot this saving of materials offset the entire expense resulting from the alloy, small as it would be in any case, for ordinary foundry purposes?

At one of the greatest construction works of the country large cylinders which are poured very hot show iron with a low tensile strength even if the silicon and phosphorus are kept quite low. Were the titanium alloy added here the extra heat would only result in an advantage, for the hotter the more complete the incorporation. In another foundry it was observed that the solidification of the metal in the moulds was retarded considerably, and this may be explained by the very high specific heat of the alloy used. Here, then, is another advantage especially for roll makers who wish to keep on feeding into the head a long time.

Albert L. Colby, metallurgical engineer, of the Bethlehem Steel Co., of South Bethlehem, Pa., took issue with Mr. Rossi on account of his comparison of titanium with nickel, and said that the Bethlehem Steel Co. has made more experiments than any other steel company in the world with various metals for the purpose of strengthening steel, and the high quality of steel obtained had amply justified the addition of alloys. "I am willing and am able to sustain what Mr. Rossi has said of the deposits of titaniferous ores in the Adirondack region," said Mr. Colby. "From experience I have found it more plentiful than game. Mr. Rossi, however, offers us no figures on the cost of this titaniferous alloy which he wishes to be added to iron and steel for the purpose of improving the physical properties. From experience I have found that it is hard to mix this alloy with iron and steel on account of the difference in specific gravity, whereas nickel and iron are very readily combined."

John G. Sadlier, vice-president and general manager of the Springfield Foundry Co., Springfield, Ohio, followed with a paper on

The Problem of the Molder.

from which we take the following:

It seems to be the aim and object of many proprietors to teach their apprentices or beginners to make one piece, and when they succeed in making that very satisfactory, to keep repeating the operation from year to year as long as they will stay in their employ. In many cases the apprentice becomes tired of this state of affairs, and seeks employment elsewhere; and if he secures it and is able to hold his position at all, he will be given the most inferior and simple work in the shop, for the simple reason that he has probably been tried on something better, and has failed to give a satisfactory result. Once he has been relegated to what is known as the side floor in a shop, it is very difficult for him to get a change. The result is, he will never rise above a third or fourth-class mechanic.

Another great reason for the slow advancement of the foundry is found in the peculiar characteristics of the business itself. There is nothing in the way of mechanical arts or mechanical sciences that requires more thought, more mechanical skill, and more skillful practice.. In all the other trades and professions there are rules, tables, gauges and fixed and systematic order, that can be and are applied to the different requirements; besides these a great amount of literature well and ably written, giving full and detailed instructions as to the quickest, safest and best method of accomplishing certain results. Tables on strengths, tables on pressure, tables on measurement and many others that are used are the result of ages of experience and practical test. All these fall short when you come to apply them to molding, as that is learned almost entirely by the sense of feeling, a sense which can not be transmitted to another, nor can it be transferred to paper. It is something that must be acquired

HEADQUARTERS
THE NIAGARA HOTEL
AFTER LUNCHEON AT THE
INTERNATIONAL HOTEL NIAGARA FALLS
FITZPATRICK GIVES LOGAN
A TIP ON THE SEA COAL MARKET
AT THE HORSESHOE FALLS

by actual practice. The sense of touch plays such an important part in the construction of a mold, that without it it is impossible to construct a mold with any reasonable expectation for success.

The feeling of the sand for its proper temper, its adhesive qualities, and as to its porosity; then in ramming, the molder's sense of feeling should be trained to such a degree that he can tell at every stroke of the rammer whether he struck the bottom with sufficient force to ram the sand to stand the strain of the iron, or to prevent it from crumbling if dried, or to lift well in those parts which are to be raised off.

The material handled by the molder is of a very delicate nature, and is easy to disarrange through a very slight mistake in any way. Then, again, the iron delivered to him is very frequently too dull to make clean, sound, perfect castings and consequently his labor is all in vain.

If the clerk in the office in adding up a column of figures makes a mistake, it will show up in the trial balance for correction. If the pattern maker makes a mistake in a pattern, a little beeswax, putty, glue, a stick of wood with a jack-knife and chisel, will correct the mistake, as it is at all times apparent to the eye. The materials from which the patterns are constructed are of a very solid nature that will not crumble away with the slightest touch of the hand. Many of the mistakes in the machine shop are overcome by fitting another piece to the one that has been spoiled, as an error in measurement. In the foundry, a slight mistake or oversight will cause the entire day's and sometimes the entire month's work to go to the scrap pile. A mistake or oversight here can not be seen in time to correct, consequently the molder is looked upon as careless and indifferent. He has probably made two molds from one pattern as near alike as possible; the casting from one will be a beautiful thing to look at, and the other will probably be a mis-shaped, ungainly candidate for the scrap-pile.

The best method to overcome these difficulties would be to leave nothing undone to educate the apprentice after he has secured a position in the shop in which he proposes to learn molding, as complete as possible, through his course of apprenticeship, until we land him on the highest rung of foundry fame. And in doing this we hope, in a measure, to solve the molder problem.

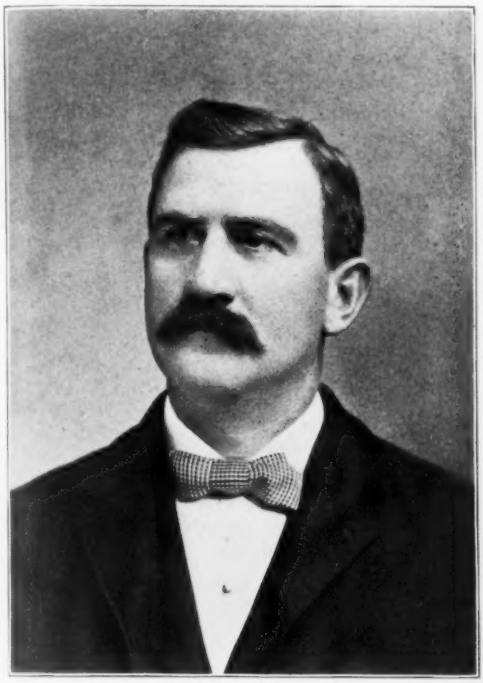
Before starting a boy in the shop as a full fledged apprentice, I would ask my colleagues in the foundry business to take this applicant for foundry honors on a probation of, we will say, three months; during which time he should be continually under the eye of the foreman, or his assistant, and watched very carefully without interfering or in any way coercing his action. If he exhibits an inclination to learn, is industrious, and becomes thoroughly interested in his efforts to become familiar with foundry practice, he should be assigned some slight duty that would make him profitable. At the end of the probationary period, make a contract with him for three years and nine months, giving him the benefit of the three months as a novice. If at the end of three months' probation he does not seem inclined or interested, it would be a kindness to the boy to request him to try something else.

I do not believe that molders are born, not made, but I will say that unless you have the material in the individual to make a molder, you can not possibly accomplish anything. After he has been accepted and regularly indentured, then it becomes very much the duty of the foreman to see that he will become a competent man and a good mechanic.

The boy starting in on his first piece feels a certain amount of excitement and interest which should be cultivated and kept alive. He should not be scolded, cowed or bully-ragged for a slight mistake, but should be encouraged by a few kindly spoken words, as there never was a brow-beaten and cowardly apprentice who made a successful or first-class molder. It is by implanting the spirit of "I can" and "I will" in the heart of an apprentice that you obtain the best results. What I mean by a cowardly apprentice is not the boy who will be afraid to knock his shop-mate down for an insult, nor to be afraid to resent harsh words, or ill treatment, but the one who is afraid of losing the casting he undertakes to make. I believe there are more castings lost through an overanxiety to make the work correct than from carelessness or any other cause. Every shop should have one or more first-class journeymen whom the apprentice should be encouraged to take as his model, so far as possible. Yet it is necessary to encourage originality after a certain period. The apprentice should be encouraged to be self-reliant, and be advanced as he succeeds in making good and satisfactory work. The older molders should not be allowed to stand in the way of advancing the apprentice on to the very best work in the shop, if he

proves himself able to turn it out satisfactorily.

The apprentice should further be encouraged to interest himself in all the details of foundry practice, the character of the sand best suited for the different classes of work, and also the different brands of iron that go into



W. F. PRINCE.

the mixtures for different grades of castings. In fact he should be taught that the mixing of the metal and cupola practice is second only to the making of the mold itself. The character of the coke, the height of the melting point in the cupola, the regulation of the blast, the temperature at which the iron is melted, and the grading by fracture and other methods: all these he must be shown to have the greatest bearing on the finished casting.

The time spent in the education of the molder's apprentice in all points of foundry practice pertaining directly to the making of the casting, is one of the best investments any foundry manager can make, for it is the apprentice, well educated in these matters, who makes the first-class molder.

Mr. Sadlier added the following: "The molder employed in American foundries is degenerating. I am talking from experience, having spent many years as a molder in the foundries of this country. It seems to me that the molder of today is not required to have nor does he have the same knowledge of molding as was possessed by the craft 15 or 20 years ago. They are retrograding into a class of specialists and a molder that can do general founding is hard to find. I say that this lack of knowledge on the part of the molder is largely blameable on himself, inasmuch as, after he has served his time in one shop on one kind of work, he goes out and calls himself a molder. By no means is he a molder; he is a specialist. I think on the other hand that the foundryman is also guilty. He keeps a molder on one kind of work if he shows aptitude for it, with the result that the molder gets no general training. Even in this age of specialization, a certain percentage of general molders

THOMAS D. WEST.

will be required in the shops of this country, and unless something is done to educate the apprentices in our shops, the loss of this class of molders will be largely felt."

S. Groves, of Pittsburg, heartily concurred in the remarks of Mr. Sadlier, and said that it

would pay any foundryman, and would pay him well, to give the apprentices an opportunity of helping on first-class work and to instruct their molders to help them in every way possible in the work on the foundry floor.

Mr. Thos. D. West of Sharpsville, Pa., followed with a paper entitled

Effects of Variations in Manganese on Different Grades of Cast Iron.

In it the author describes some experiments conducted by him to establish the effect of manganese upon cast iron. He says:

"In a general way, the addition of manganese to the iron in the cupola increases the hardness by raising the percentage of combined carbon, which means greater contraction and chill, with a decrease in deflection and elasticity. While it is true that manganese in cupola mixtures has the tendency just mentioned, experiments show that the variation of manganese generally existing in any one grade of pig iron will have very little, if any, effect on the physical properties of the casting. Something which is entirely different from the changes due to the silicon and sulphur of iron coming from any one mixture of ores, flux and fuel. Tests show that the addition of manganese in the ladle tends to increase hardness, contrary to what has hitherto been written on this subject. However, when we come to low silicon irons, we find that manganese in the ladle is very effective in throwing out graphitic carbon, or softening the iron, and very sensitive as it produces radical changes here.

"The effect of manganese on the strength of cast iron is its tendency to make iron stronger. In adding manganese to molten metal the iron should never be dull, but as hot as practicable in order that all the manganese may be melted in such a manner as to give a homogeneous mixture. Where iron is dull a fracture may often show little bright spots or grains of manganese alloy which did not melt or mix properly with iron. In such cases more harm is done than good.

"One peculiar effect of adding manganese to cast iron is that it causes the sand to peel more freely from the castings. With the very same iron free from manganese the sand will stick very strongly to the castings. This may in a measure account for some castings of the same pattern peeling much more easily than others, even if made with the same grade of sand and facing and poured with metal of equal fluidity, a phenomenon we have often been at a loss to understand."

Briefly discussing Mr. West's paper, Mr. A. L. Colby, of South Bethlehem, Pa., said: "The advantages of manganese in foundry pig iron may be summarized as follows: It adds strength as it raises the combined carbon. It adds fluidity. It increases density, as it removes gases producing blow holes, and also makes a more uniform grain due to a more regular distribution of graphite, so that in machining you obtain the advantage of a much more uniform grained material to work on. Manganese is especially advantageous when presented in a high silicon iron, for it makes a soft, dense, strong casting."

Edward B. Gilmour, of Milwaukee, Wis., then read a paper on the

Equipment and Management of Foundries,

from which we take as follows:

In order that the foundry may keep pace with the other industries, it behooves foundrymen to adapt themselves to their surroundings and advance with the times in supplying the demand as it comes forth. This can only be done by building and equipping foundries on the most modern principles and getting rid of the idea that all that is essential is simply to have a crane, cupola and a drying oven, because to the unpractical mind this is about all that can be seen. These appliances are certainly the most important that are there, as is evidenced when visitors enter the foundry, the foreman showing with pride how fleetly his crane can run and how many movements can be made with it at one time; he will also revert to the cupola and expatiate upon its merits as a melter in quantity and quality.

In the first place we will consider what a modern and up-to-date foundry should be when quantity and quick deliveries together are of greatest importance. The foundry should be built so as to have easy access to all other departments, especially the pattern shop and machine shop; it should be in a position to receive the greatest amount of light and air in order to dispell all of the obnoxious gases generated while casting; there should also be the greatest amount of comfort possible for the men employed therein, because in winter time, when it is excessively cold, you cannot get full value from the men when they do not feel comfortable, and in summer time, when it is extremely hot, if your place is not well ventilated, the men will very often walk home after the company has been at the expense to get up steam to run the plant. The main point in building a foundry is to concentrate

WHERE SOME LARGELY ATTENDED AND SUCCESSFUL MEETINGS WERE HELD NOT MENTIONED IN OFFICIAL PROGRAM
SUMMER GARDEN
SAMUEL GROVES DELIVERING HIS LECTURE.
THE ARMORY WHERE THE SESSIONS WERE HELD.
D P LETCHWORTH WATCHES THE CROWD LEAVING THE HOTEL FOR SPECIAL TRAIN TO THE FALLS

important operations as near the center as possible, as a very long, narrow foundry may be a source of trouble by causing many delays, because one crane cannot pass on account of another being in use at some inconvenient place. It is desirable to have a crane equipped with double trolleys, the reason being obvious, for when there is a very heavy piece to make it is not practicable to put all the metal into one ladle, as this might be too heavy a load for one point on the crane, whereas if the crane has double trolleys a ladle can be suspended on each hook, which will amount to having two cranes. I have often seen three cranes used to pour a large piece, four ladles being used, one of the cranes taking two ladles (when one was emptied it had to be dropped down and another which was in readiness picked up). If the cranes had double trolleys they would have only used two cranes and done the work more expeditiously, thereby leaving the third crane free to take the iron away from the cupola and cause no inconvenience. In taking out heavy castings both hooks can be attached to a piece exactly as if two cranes had been employed. In the case of large molds, where two cranes are required (such as very large fly wheel molds), they can be lifted in the same manner. If at any time one of the motors should burn out the block can be hoisted out of the way, and the other trolley used until there is time to have repairs made, thereby avoiding the loss of time by having men waiting until the crane is in readiness again. In many cases where two cranes are used to roll over heavy molds, one crane with two trolleys will serve the purpose just as well and save the inconvenience of keeping one crane waiting for the other.

At the end of the shop there should be placed stationary spindles for loam work, a wall crane provided between every two spindles in order to lift them as well as light plates out and in, as desired, so that there will be no waiting for the large crane. When the spindles are out of use they can be suspended to a short chain attached to the pillars, and the arms can be pulled up against the wall, well out of the way. The drying ovens are placed in the side wings, three at each side (or as many as may be desired), the tracks are run clear across the shop, so that a mold can be put under any of the cranes, so that all three of them can be used in connection with the same oven track at the same time if required. The cars are run out of the ovens with an endless link belt chain, a loose chain being hitched to the car with an "S" hook which can be attached to any link of the chain. Near the center of the shop are the cupolas which are set up pretty high in order that an eight or nine ton ladle can be placed upon a truck and run underneath the spout. When filled it may be transferred under any of the cranes, or it can be side-tracked and another ladle set under. The end of the shop is reserved for the cleaning of all castings, and a railroad spur put in far enough to load and unload trucks with each crane. The tumbling barrels are placed in line with the sand sheds, so that the noise and dust may be kept outside of the foundry. Double emery wheels are placed in the side wing, and benches provided with vises are installed in order to chip the small castings. On one of the tracks there can be placed a track scale large enough to weigh a regular flat car. All castings should be marked with weight and date of making, and a record kept which can be referred to at any time in order to know the exact mixture of the metal used in them.

Attached to the foundry there should be a chemical laboratory, also equipped with a complete set of testing machines in order to make all the required mechanical and chemical tests. I am of opinion that both are essential in all well regulated foundries. I also believe that it is necessary for a foreman in the foundry to be possessed of some chemical knowledge on the mixture of metals and other materials used in the foundry. This knowledge can be easily acquired by any one who is desirous to receive the information, and I predict that in the future it will become one of the indispensable qualifications of any one who wishes to become a foundry foreman.

Along each side of the foundry is a railroad siding intended to distribute the coke to the ovens and the cupolas. The sand and other materials required in the foundry is placed in sheds built against the foundry wall, which serves to keep out the frost in winter time.

The cupolas should be provided with a regular system of trolley tracks and suspended trucks running from the pig iron sheds direct to the elevator, and from the elevator to the charging door of the cupola. Each truck should hold a complete charge for the cupola. There should be a liberal supply of trolley trucks in order to save handling the iron too often. When these trucks are emptied they can

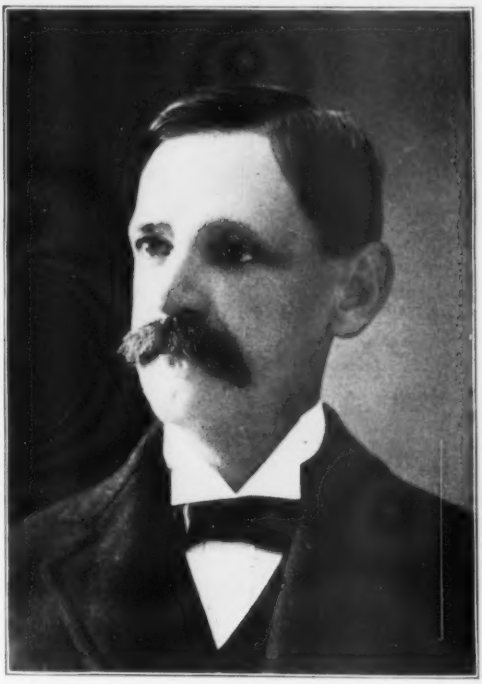
be returned by the return track to be refilled. A scale can be arranged in connection with the trolleys to weigh the charges. The trucks can be raised and lowered upon the scale by means of a long lever suspended from the trolley. In close proximity to the scale there should be a black-

T. H. COLVIN.

board with each day's heat properly recorded, having columns itemizing the mixture of each charge, and these charges should go in their regular order so as to prevent confusion. The order of the charges should be made out by the foreman each day and a correct entry recorded in a book provided for the purpose.

The foundry business requires incessant study, as I have said, but it very rarely receives it, for when a bright boy comes into the foundry he very soon becomes dissatisfied on account of the nature of the work, it being hard and dirty, as everything in the foundry has to be produced by manual labor. Whenever this boy discovers any improved method for producing a piece, it is simply adopted as a matter of course in the shop in general, and he receives no credit for his study. Such is not the case in other trades.

In equipping a foundry the manager should always be open to conviction and get the best tools which may be procured for the purpose at the lowest possible cost. In some large foundries it is customary to use a cross to lift heavy molds. Attached to this tool are heavy slings, which are made in many different styles. Some are simply huge links, and when these are used it is necessary to have a large assortment in order to suit the various requirements. Again, some foundries have slings made in a most ingenious manner, and which can be extended to any length, and serve the purpose admirably. The most improved method of lifting heavy molds, however, is with a steel beam, best made of an I section and suspended at the center. A double shackle or clevise, with a loose hook on each end, which slips out and in on the beam to suit the requirements, is employed. The reason for using double shackles is that with an uneven load the beam is suspended directly with each half, independent upon the hook of the crane, whereas if only the single bar is used, at the least swing of the crane the load will roll in the



J. P. GOLDEN.

hook at the risk of upsetting the mold. Chains of ample strength are suspended from these hooks, which are lengthened at will to suit the requirements. This is by far the most expeditious method of lifting heavy molds. The chains are more flexible and are light to handle

and the device takes up very little room when not in use. A good rule to go by in making these chain hooks is to double the size of the chain; thus for ¾ chain use inch and a half square iron bent over the diagonal section.

For the purpose of curbing, some founders use sheet iron plates about 72 inches by 30 inches, with a row of holes at each end in order to bolt them together. This is a very crude and slow method. Other founders use a cast plate made with lugs on the ends, so as to allow a pin to join the plates together. This plate, I believe, has been patented, and is made in various sizes to suit the requirements. Being of cast iron, they are very heavy to handle, but are very good. In my opinion the best and most practical plate for curbing purposes is simply to take a steel plate three-sixteenths of an inch thick, 27 inches high and of various widths, to suit the circumstances, such as 36 inches, 24 inches, 18 inches, and 6 inches. For making runners it is advisable to have them 14 by 14 inches. These plates are very light, are easily transported from place to place and take up very little room in stacking up out of the way.

For binding or fixing molds together, bolts are the best. They can be made in various lengths, also lengthened to suit the requirements by using reverse hooks linked in a triangle or sling, which is put over the lower handles. These hooks should be made 6 inches, 12 inches, 24 inches, 36 inches, and so on, in any length as desired, and should be made of no less size of iron than 1¾ inches.

In the green sand shop there should be a plentiful supply of gaggers and an abundance of clamps and a place to put them. For all standard patterns there should be flasks for the purpose, with follow boards. All flasks which are too heavy for hand lifting can have trunnions bolted on the sides, so that they can be rolled over without lowering down; unless when too large, as they are then apt to spring a little. I have rolled very heavy flasks with trunnions, however.

In this age of economy it is not practical to have molders do work which can easily be done by the helper. All flasks should be fitted to the pattern before being brought to the molder, all facing sands should be mixed and sifted by a power sieve and brought to the molder. The iron for casting should be carried by large ladles or conveyors, so as to be handled quickly and cheaply. The castings should be taken off the floor at night, and the sand watered and cut up ready for use when the molder comes to work in the morning. The same rule applies to the loam shop, as molders are better satisfied to do only molding work. It is a good practice to have two men follow the crane and lift all work under the guidance of the molder making the piece. These two men will endeavor to locate all work in such a way that it will be for the general good. The manager should have complete control of his men. He should not become too familiar, as familiarity breeds contempt. He ought to be a good mechanic and competent to give advice whenever it is required, and not afraid to assume responsibility. Whenever orders are given they should be definite and decisive, because when orders come from one in command which are not decisive the men who receive them become careless and pay little attention. To a man possessing the requisite qualifications to become a competent manager a liberal salary should be given, because the success or failure of the company is determined by a proper knowledge of the business being entrusted to him, even if the company has unlimited capital.

In the management of the foundry there is nothing of more importance than to have a correct accounting of all that transpires. This can be accomplished by a regular system of bookkeeping, so that the foundryman can intelligently estimate on whatever contracts may be upon the market. There should be a storeroom for the foundry and all materials should be checked by the storekeeper, who should also be supplied with a regular set of books for recording everything. There should be a proper place for everything, so that he can hand out the goods as quickly as possible, and not have men lounging around the window. Whenever supplies are given out, he must record them against the job and the individual, and when the person knows that everything is recorded against him he will be very careful not to be wasteful. This storekeeper can also check up all castings which are delivered to the different departments, and in return take a material slip properly signed by the party receiving such castings. At the end of each month these books are balanced, and the cost per pound of every casting noted. An average cost of all castings should also be made, so that the foreman can instantly know how the foundry is doing, and if there should be any discrepancy he will know just where to locate the trouble.

Mr. West said that he believed that the day

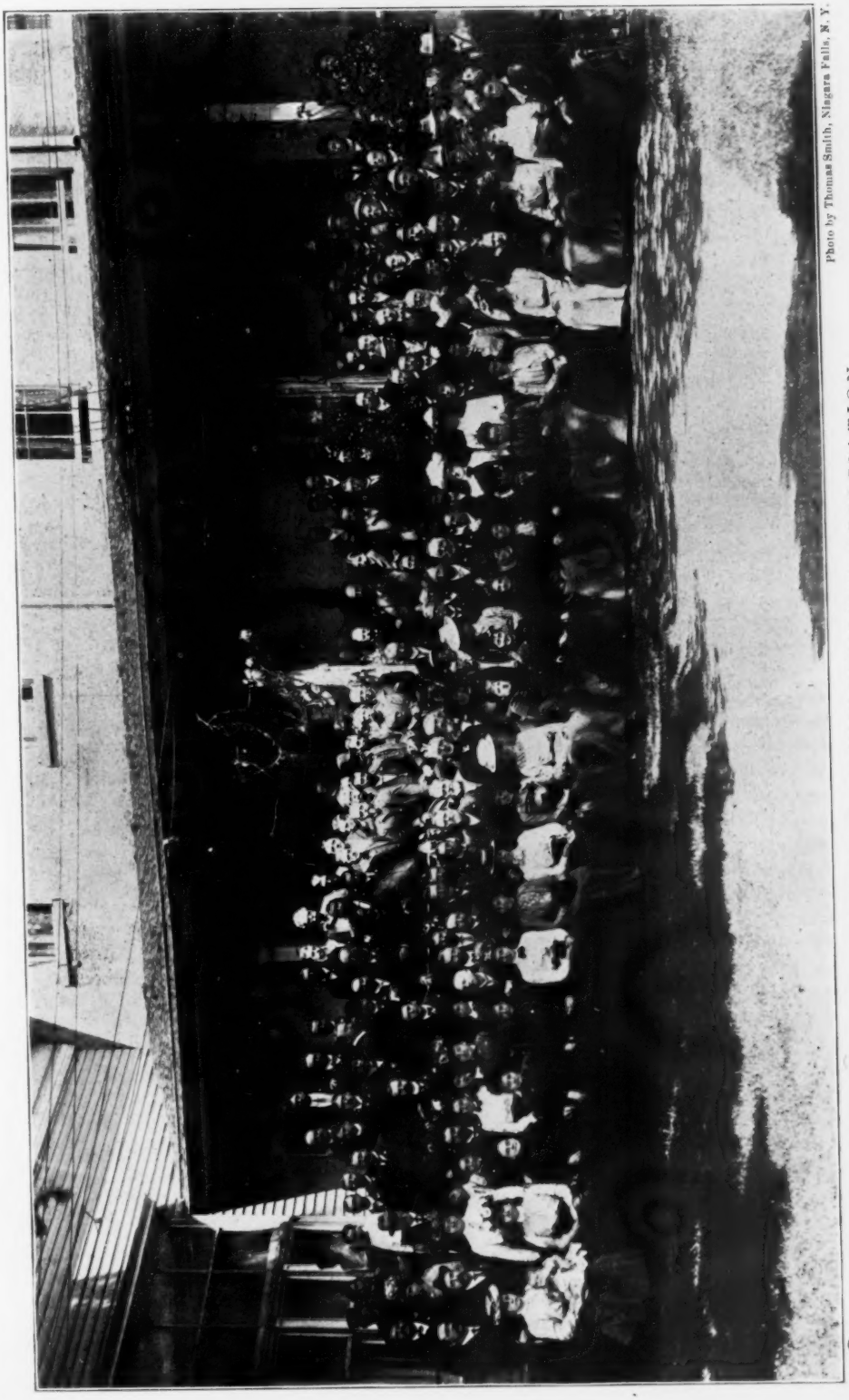


Photo by Thomas Smith, Niagara Falls, N. Y.

THE AMERICAN FOUNDRYMEN'S ASSOCIATION.

A GROUP OF MEMBERS AND VISITORS AT NIAGARA FALLS, N. Y.

is not far distant when the foreman of the foundry will also be a chemist, and that his technical training will far exceed that of the present. He advocated a school in foundry practice for the education of foundry foremen and superintendents, and believed that foremen should be so educated that the proprietor of the foundry will be enabled to discuss with him matters pertaining to the operation of the foundry in a manner that will be beneficial to the proprietor.

J. A. Lanigan, of Lawrence, Mass., did not favor the suggestion made by Mr. West that foundry foremen should be chemists, inasmuch as a man in preparation for such a position would be compelled to spend his best years in school. H. McPhee, of Bridgeport, Conn., concurred in the remarks made by Mr. West in favor of a better training for foundry foremen, and hoped to see the day when a school of some kind will be established for them.

President Jones blamed the present condition of affairs on the shortcomings of the apprenticeship system. "We have no way of holding the boys in our foundries. They commence to work for us to learn a trade and when they have gained a little knowledge they leave because they have been offered a little better pay elsewhere, and the result is that they do not become thorough molders. There is not the incentive today to make the full-fledged molder. But do not misunderstand me. We are surpassing the world today, not with the best mechanics but with the best specialists. These two points are to be taken into consideration in the discussion of this question. In Chicago today there is a large manufacturing establishment where the apprenticeship system is almost down to perfection, to my mind. The boys, after serving their time there are urged to seek employment elsewhere in order that they may learn how operations are carried on in other shops, and after considerable such experience can always return to the shop in which they served. They have gained knowledge in other shops and return with all this wide experience for the benefit of their employer."

C. S. Bell said: "In the foundry of today we have introduced the molding machine. This reduces the proportion of skilled men required and takes away the molder's interest. The result is that he is only a part of the machine which he operates. We take in boys and if they show a proficiency on a certain line of work we keep them at it. I must say with emphasis that we are greatly indebted to the shops that are making our mechanics. To say that there are no better molders today than there were twenty-five years ago is wrong. Today they do things in the shop that they were not able to do only a few years back. However, we must remember that machines and specialists are bound to make machine men."

A paper contributed by Percy Longmuir, of Sheffield, Eng., entitled

Control of the Foundry,

was then read. The author insisted that the foundry foreman should be capable to take complete charge of metallurgical as well as mechanical operations in the shop. His ideas along these lines may be found in an article contributed by him to *The Foundry* and appearing in our issue of November, 1900, under the heading "Foreman or Chemist."

Trip to the Exposition.

On Tuesday evening the Buffalo foundrymen provided a special train, which conveyed the delegates and their friends to the grounds of the Pan-American Exposition. Arriving there, individual groups were formed and a couple of hours pleasantly spent in viewing the many attractions.

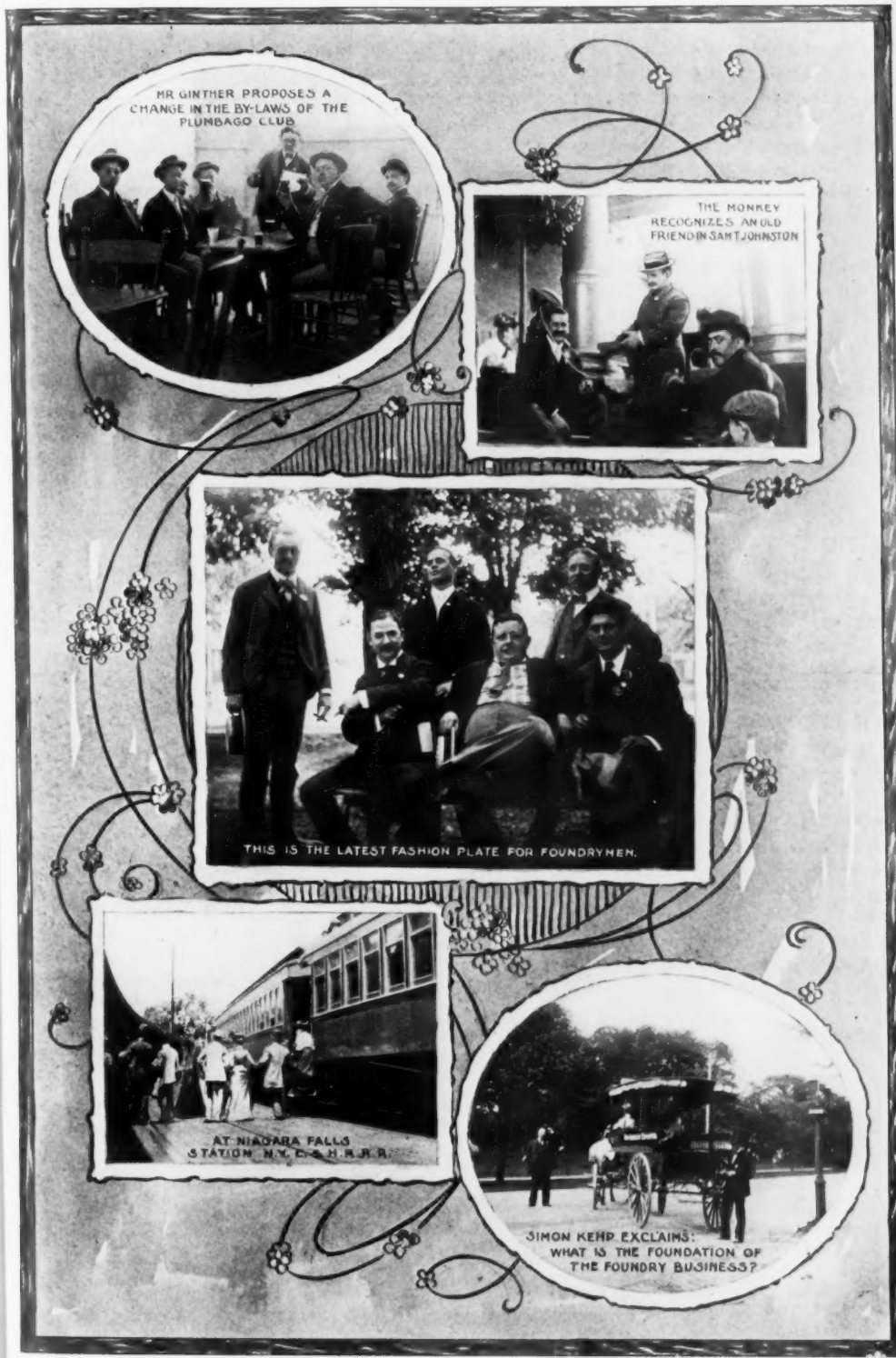
Excursion to Niagara Falls.

On Wednesday morning the Buffalo foundrymen gave the visitors an outing to Niagara Falls, a special train being provided. At noon an elaborate luncheon was served at the International Hotel, the delegates being later photographed in a group. During the luncheon Willis Brown, of Erie, Pa., was introduced as toastmaster, who in a neat speech complimented the Buffalo foundrymen on the care bestowed upon the visitors. Fitting remarks were also made by O. P. Letchworth and others.

After luncheon the visitors scattered in groups to view the magnificent scenery surrounding the falls, a great number taking advantage of the opportunity to make a trip along the Niagara river on the Canadian side and returning by the Gorge route on the American side.

Wednesday Evening Session.

A memorial was presented to the American Foundrymen's Association by a committee composed of Thos. D. West and Dr. Richard Moldenke, appointed by the Pittsburg Foundrymen's Association, calling for a better system of grading pig iron than is at present in vogue. Mr. West's original paper on this sub-


MR GINTHER PROPOSES A CHANGE IN THE BY-LAWS OF THE PLUMBAGO CLUB
THE MONKEY RECOGNIZES AN OLD FRIEND IN SAM'L JOHNSTON
THIS IS THE LATEST FASHION PLATE FOR FOUNDRYMEN.
AT NIAGARA FALLS STATION N.Y.L.E.&W.R.R.R.
SIMON KEMP EXCLAIMS: WHAT IS THE FOUNDATION OF THE FOUNDRY BUSINESS?

ject appears in THE FOUNDRY for April and in answer to the following questions: (1.) Do you approve of the establishing of more uniform methods for grading pig iron by analysis? (2.) Do you endorse the method outlined by Mr. West's paper? (3.) If not, please state your opinion as to what division of silicon, sulphur, etc., you think best in the grading of pig iron, and state what views you hold on this subject which you would like to have considered at the convention, many replies were received, indicating that the foundrymen were interested in the establishment of more uniform methods.

Mr. Alfred Ladd Colby, of the Bethlehem Steel Co., followed with a lengthy discussion on the points brought out in Mr. West's paper and described the system in use at the Bethlehem Steel Co.

S. B. Marshall, of the Dunbar Furnace Co., suggested a different system from that proposed by Mr. West, which he felt would cause more or less trouble in its details.

Paul R. Ramp, of Aurora, Ill., read a paper on

Green Sand Cores,

which follows:

This subject bears directly on the foundry business and is one of the important features in molding. A green sand core is a core constructed from the same material used to make a green sand mold. It is not dried in an oven but placed in the mold as soon as completed, thereby saving the fuel that is necessary to fire the core oven when dry sand cores are used. In making light castings the green sand core has an advantage over any other core because it overcomes the rough and irregular joints that are often found where a dried core and a portion of the mold come in contact with each other. In cases where a large core is nearly completely surrounded by a thin casting the green core is the best also. If a dried core is used there is always a liability of the heat from the casting causing the material in the dried core to expand and thus break the casting. Another advantage is when cleaning castings a very large dry sand core requires considerable time and labor to dig out of the casting; if a green sand core is used all that is required is to rap the casting in order to remove the sand.

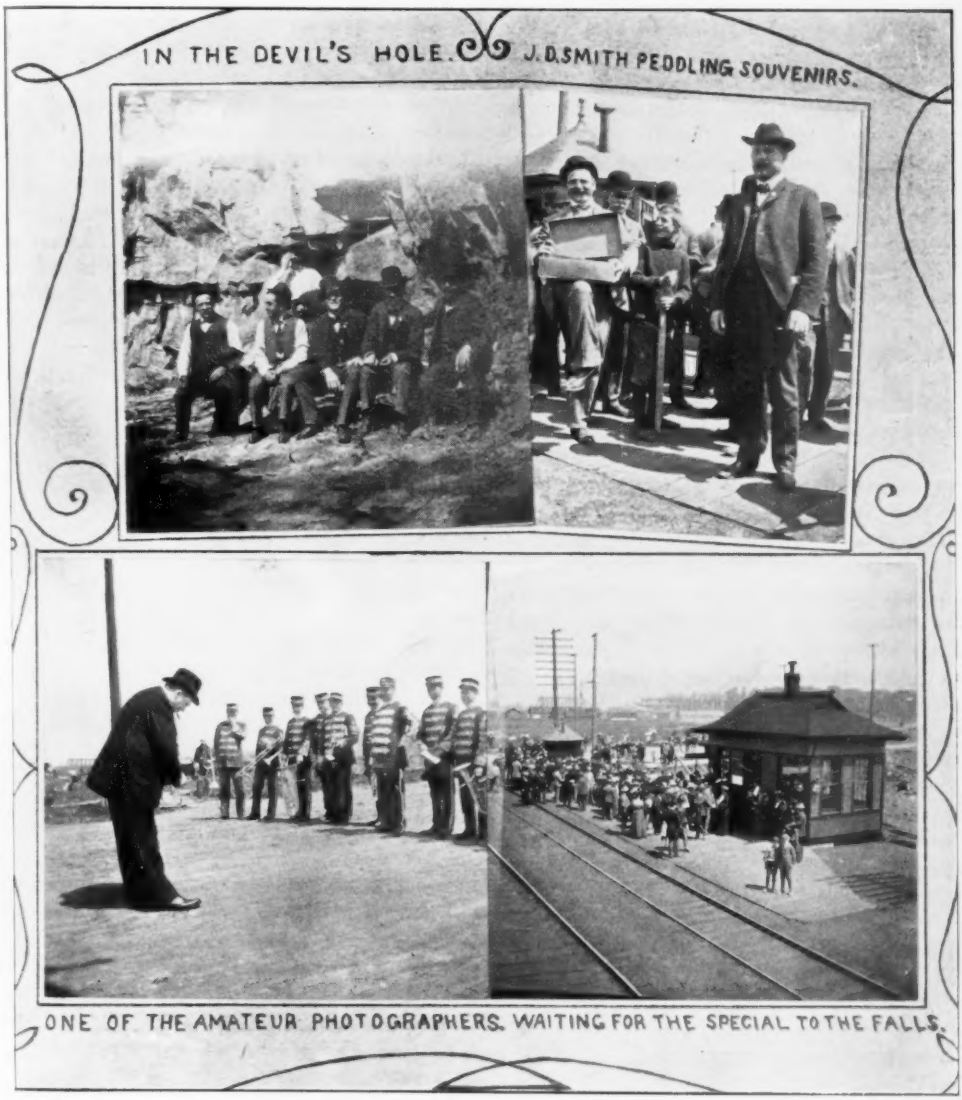
Green sand cores can be used to advantage in the production of plumbers' ware, i.e., soil pipe, elbows, tees, etc. Also locomotive smoke stacks, railroad oil boxes, and similar castings. These cores cannot be made strong enough to be handled without some kind of a support. An arbor usually made of cast iron, often of wood, is used to carry them.

In making a green sand core for a locomotive smoke stack the proper rig would be a cast iron core barrel 1 inch thick, the shape of the cored portion of the stack, allowing only about 1 inch for sand between the barrel and the inside of the stack. The barrel must be covered with prickers about 1½ inches long by ½ inch in diameter, tapering to a point, in order to carry the sand. There should be equally as many ½-inch holes in the barrel to allow the gas to escape freely. Both ends of the barrel should be turned off to suit the ends of the flask the mold is made in. The core is formed by setting the barrel on two wooden horses with iron bearings attached to them for the spindle of the barrel to rest in. The sand is now pressed between the prickers and a strike of the proper shape is placed on the wooden horses the right distance from the barrel, a crank is used to turn the barrel as fast as the sand is pressed between the prickers. In this manner a stack of any thickness may be made from one core-barrel. As soon as the mold is poured and the casting is cool enough a chain is hooked on to the end of the barrel and the barrel and casting are hoisted to a vertical position. A little rapping on the casting will cause the sand between the core-barrel and the casting to run out and relieve the stack, which will drop off of the barrel. In this case a dried core would make a very poor job. Not only would it cost more to make the core and furnish the material, but, as stated before, the expansion of the material would break the casting because it generally averages only about 3-16 inch thick.

Core barrels for soil pipe cores are made on the same principle, instead of prickers, however, depressions are made in the barrel. Where it is not possible to use a core barrel arbor and anchor, lifting plates are used. Often the arbor must be made in sections to enable the molder to get it out of the casting after the mold is poured. Lifting plates are generally made with threads for lifting screws to make it possible to take the screws out after the green sand core is placed in its position in the mold. There is considerable core sand and labor saved in making railroad oil boxes with a green sand core. In this case an arbor made in sections is used, the shape and number of sections depending entirely on the size and shape of the oil box.

There are many small dry sand cores (such as cores forming round and square holes of

different sizes) used that could be made in green sand much cheaper. One of the reasons they are not made in green sand is because the pattern maker, as a rule, carries a stock of core prints of different sized round and square cores. He, knowing there are core boxes for a lot of small dry sand cores, say 1 inch by 1½ inches, that could just as well be made in green sand. There is, without a doubt, quite a sum of money spent every year for labor and material to make dry sand cores that could just as well be saved or put to some better use.



SOME SNAP-SHOTS TAKEN DURING THE CONVENTION BY H. J. ROBER, OF THE BETTENDORF METAL WHEEL CO., SPRINGFIELD, OHIO.

the different sized cores in the foundry, finds it much less trouble to tack on several small ready-made prints than to finish out several holes the same size so they will leave the sand properly. As a result the foundry foreman is disgusted to find that he is compelled to make

So it is with the dry sand cores, we often find foundrymen worrying along with a job trying to use green sand cores where a dry sand would be the cheaper. To be able to judge which of the two kinds of cores is the better and cheaper to use in making any certain job,

we must have practical experience in the business. For instance, in case of the smoke stack a dry sand core would not be practical, neither would a green sand core for the steam ports or bore of a Corliss cylinder be a success.

Green sand cores are not good for making bulky castings where there is a heavy pressure of metal. One reason is because it is not possible to make a green sand core hard enough to withstand as great a pressure as a dry sand core will stand without a cut or scab. Another point in favor of the dry sand core is when it is placed in the mold, say an oil box, if it does not give the proper metal on all sides by reason of it not being placed in properly, it can be taken out and reset, whereas, in case of the green sand core it is very risky business to remove it after it has been placed in the mold.

In making light castings there are many cases where the green sand core can be used to a decided advantage. On the other hand there are cases where the dry sand core is the better. I am a little inclined to favor the dry sand core except in cases as mentioned above. Because I think the dried core is the safest and in making castings of any great size that must be free from dirt, etc., I have always found it cheaper to make a dry sand mold. Many foundries do not favor dry sand cores. Often it is because the core sand they are using is not what it should be. In making cores for locomotive and Corliss engine castings I use for my core sand mixture about 6 parts heavy molding sand and 4 parts sharp building sand. If my castings do not clean very well or show dirt, I add a little more sharp sand. Many foundrymen worry about the blacking. My experience has been, if I used a good open sand and have vented the core well, and had it thoroughly dry, a fair grade of blacking always did the work as well as a more expensive grade.

The foundry supply men often speak of the different foundries that use their blacking. I always think, "Well, no matter how good the blacking if there is not a good open sand behind it."

We often find cases where the blacking on the dry sand mold or core has washed off in flakes before the iron while it was being cast. One of the old established remedies for this trouble is molasses-water. This does some good, but I feel satisfied that a little more coarse sand in the mixture would be of more benefit.

Mr. Herbert E. Field, of Ansonia, Conn., followed with a paper on

Foundry Metallurgy,

from which we reproduce the following:

Does it pay? This is the first and all important question that comes to every founder when considering the advisability of introducing chemistry as a branch of his foundry practice. Many a foundryman, attracted by the manifestly increasing interest shown at the present time, stops and asks himself this question. It may look well on paper, and it may sound well to say that we employ a metallurgist, or that we mix our iron by chemical analysis; but this is not a sufficient inducement to draw a foundry out of the well-worn ruts of its ancestors, and persuade it to accept this new method. Many conflicting arguments have been written on this subject, but I have yet to learn of a foundry that has given it a fair and thorough trial and then has relinquished it. The future of foundry chemistry depends, however, upon the question: "Does it pay?" It may be truthfully said that the amount of saving depends to a great extent upon the class of work in which a foundry is engaged, upon its methods, and upon the men employed. A foundry melting ten tons a day can hardly expect to support an expensive laboratory, and a high-priced chemist, neither can a small laboratory, with an inferior metallurgist, make an appreciable showing in a large foundry. Judgment must be exercised in the introduction of chemistry as well as in any other branch of our foundry work.

Furnace men admit that foundries buying on specified analyses are getting the best of the product turned out from the furnaces. All furnaces make more or less poor iron, and this is very apt to go to the one who buys without specification. If you did nothing but to have a competent metallurgist furnish you with analyses best fitted for your work, and to insist that the furnaces send you iron which would fullfill these analyses, you would surely get a much superior quality of iron. The ability to make use of that grade of iron which can be bought cheapest at various times enables a laboratory to add much to the credit side of the ledger. The founder who is confined to the use of one of two brands of iron, and who cannot profit by a low price quoted on some other iron, is certainly at a disadvantage in competition with a founder who by use of his chemical methods can buy at the best prices the market offers. Irons frequently

run better than specified, and an analysis of the car shows that it will carry more scrap, or more of a cheaper grade of pig iron, which may cause a considerable saving on that lot of iron.

Other arguments in favor of the laboratory are: the knowledge that a uniform product may be expected from your cupolas, the assurance that you will have no complaint from your customers, or from your machine shop on account of hard castings, and the saving which comes in machining these castings. The modern foundry now, more than ever, is called upon for castings to answer rigid specifications. Many foundries are compelled to reject such orders or have the castings made by others. Castings which will in every way answer the most exacting tests, formerly required of air furnace charcoal iron, can now be made from a cupola, by the use of analyses, at a cost exceeding but very little that of our ordinary castings. If the founder of cast iron hopes to hold his own against his steel competitors, he must be in a position to offer the best quality at a moderate price.

These are but a few of the many arguments which might be brought forward to show the advantages of the use of metallurgy in the foundry. There are those who succeed and those who fail in every branch of business practice, and the most benefit will be derived from the use of metallurgy by those who best adapt it to their own purposes.

There are three methods open to foundries wishing to use foundry metallurgy. Each has its advantages and I mention them in passing to show that the small foundry need not burden itself with the expense of a metallurgist while the large foundries cannot expect to get the best results from the least outlay.

The use of furnace analyses as advocated by some writers on this subject is the cheapest method as far as the first outlay goes for mixing iron by chemical analyses; it is better than nothing. Especially is this true now that the No. 2 Soft and No. 2 Special irons have replaced the former No. 1 grade. These irons can be bought in some sections at a fairly low price, and if mixed by the Silicon analysis, they may be frequently used with a considerable saving over irons graded by their fracture. There is absolutely no guide to the quality of these irons, except by analysis, upon which their successful use entirely depends. But little can be said as to the reliability of furnace analyses. I have known them to closely coincide with those made at the foundry, but frequently they vary, and the founder takes a chance in relying on this method. I consider it, however, an advantage in many cases over the fracture method. You at least have some definite specification to which you can hold your furnaceman; it is a step in the right direction.

The second method is the one which is meeting with the best results in the foundries of larger tonnage: The employment of a competent metallurgist with a suitably equipped laboratory, and with sufficient assistance to enable him to assume the whole care of the iron. Foundries engaged in special work will reap the greatest advantages from the successful laboratory. The foundrymen themselves must decide whether the quality and the quantity of their output will warrant the employment of a metallurgist. If they find that their competitors with whom they were able to compete, are now, by the employment of metallurgists, securing orders which formerly came to them, they will be inclined to believe that what has been a wise step for their neighbor may be a necessary one for themselves.

There is, however, a third method opening to foundries who do not consider that their work warrants the establishment of a laboratory, viz.: The employment of a metallurgist by a number of foundries. This has met with some success. It certainly has the advantage of saving the expense of the laboratory. To a certain extent, also, it is a saving in salary, for chemists can be employed at a much lower salary than metallurgists, and a laboratory with one competent metallurgist at its disposal, who is not hampered by the detail of analytical work, should be able to successfully care for several foundries. This cursory treatment of a rather broad subject will give a founder who has not adopted the use of a laboratory an idea of the possibilities which are open to him and of the results which can be expected if it is introduced.

One authority asserts that silicon is the only element that can possibly affect your product, or that at most, a knowledge of silicon and sulphur is sufficient to enable you to accomplish all that can be wished for in the perfection of your castings. The next writer as confidently asserts that carbon is the only element which can in any way affect iron, and he tells how unnecessary it is to pay any attention to the other impurities. Again we seek, and are told that shrinkage alone is necessary in the controlling of our mixtures, and we are to simply cast a few test bars each day, and to

use a certain machine for testing them, and all that we have been looking for, even perfection itself, is at hand. The harmful effects of these statements can be fully appreciated by the chemist who, coming to our foundries from a technical or industrial school, attempts to follow the directions written by men who are supposed to stand high in foundry matters. He had much better start with nothing to guide him than to attempt to fathom such contradictions and false statements. Those who know the least about foundry metallurgy seem to have written the most.

It is possible to have two irons of identical analysis, and yet of a very different physical structure. This statement is one most frequently brought forward by those who oppose the mixing of iron by chemical analysis. I must admit that this subject is almost threadbare from previous discussion, but I hope that a somewhat unusual treatment may throw some new light upon it. I shall not for an instant question the possibility of the statement that the above conditions can exist, and I consider that this fact shows that a more thorough education is necessary concerning the conditions surrounding the melting and casting of iron. It is a fundamental truth in the formation of all compounds that reactions take place along certain definite lines. If then, two irons of identically the same analysis and different physical properties can exist, there must be a reason. This reason lies partially in the inability of chemical analysis to distinguish between the different allotropical forms of the same substance. For example, we have the diamond, graphite, and amorphous carbon, all of entirely different physical properties, yet when treated by chemical methods, all give the one element, carbon. Silicon is known in two and possibly three modifications, as are also sulphur and phosphorus. In fact, the very elements with which the chemist has to contend in cast iron are the elements subject to such modifications. The difference in condition of these elements is wholly due to differences in heat treatment, hence the variation in physical structure in two irons of the same analysis must also be due to differences in heat treatment surrounding their formation.

Can coke iron be substituted for charcoal iron? Another subject which has caused many arguments is that of the substitution of coke iron for charcoal iron for many foundry purposes. Can one be used in place of the other with the same result? This question can be answered in the affirmative, but it must be followed by rather a large "if." There is no doubt that with a proper selection of ores, using washed coke, and a careful attention to the detail of temperature in melting and casting, this might be accomplished. Many brands of charcoal iron are now readily duplicated in those of the coke furnaces. This is especially true of those grades advertised for their high tensile strength. A combination of coke iron can generally be made by analysis, which will exactly duplicate this charcoal iron. It is more difficult to duplicate the higher carbon irons used in the manufacture of car wheels, but even this has been equalled by the coke Bessemer which is used for malleable purposes. The chief difference between the charcoal and coke iron with apparently the same analysis, is in the condition of the carbon. This is the same difference that exists between a piece of white iron properly annealed and one over-annealed. You can heat and plunge the former and change the free carbon back to the combined state, but if the graphite is sufficiently developed, as in over-annealing, heating and plunging have no effect upon this form of carbon. In other words, the carbon in our coke iron is generally in a further developed graphitic state. The use of iron pig beds in place of sand will in a measure overcome this difference, and in this statement may be found the true advantage of the iron molds over sand molds for furnace pig beds. The mere fact that charcoal or coke is used in melting or reducing the ore to the pig does not signify that the irons will be different. The higher prices commanded by charcoal iron enable a more careful selection of ores than is possible with coke iron. The use of coke iron in place of charcoal iron began extensively during a time when the coke furnaces were willing to meet any possible requirement in order to obtain contracts. This anxiety to fulfill narrow specifications entirely disappeared with returning prosperity, and gave way to a rush for tonnage which forced many founders who were having considerable success in the use of this iron to return to those of the charcoal furnaces. The substitution of coke for charcoal iron lies to a considerable extent with the furnaces themselves. The same care must be taken in the production of this iron which is exercised in the manufacture of our best Bessemer. It is probable that for a time demand would keep the price so near to that of charcoal iron that there would not be as much gain as might be expected to the founder.

Are silicon and sulphur sufficient guides in

the mixing of irons by chemical analysis? The advocates of this method have been men engaged in a limited line of work, and employing a limited variety of irons. If one is using Bessemer iron only, and is making but one line of work; and if he is so situated that he uses the product of a single neighboring furnace; in such a case I may safely say that silicon and sulphur analysis will be sufficient guides in mixing his iron. The same might be true for any foundry using a limited number of high class irons for a definite line of work, but the advocates of this method must in fairness conclude with this statement: "I use a limited number of the best irons; I make only one line of work. Only those in like circumstances need apply these conclusions." Thus would they help a few rather than to hinder many. A recent article states that all progressive furnace men and founders control their mixture by silicon and sulphur. I should hardly consider this probable, as I find that the same statement was made five years ago. It is hard to believe that our founders have made no progress in the use of metallurgy during the last half decade.

The per cent of silicon and sulphur necessary to control irons of one kind will be wholly unsuited for those of another kind. An instance recently brought to my notice will perhaps make this clear. A chemist went from an eastern foundry where Virginia and Alabama iron had been used to a foundry in a different section of the country where northern pig was principally melted. While awaiting the arrival of a carbon apparatus he analyzed the iron for silicon and sulphur. He made his mixtures with the same per cent. of these elements that he had formerly used with such good results. His iron came soft, kishy and full of blow holes. It appeared to be right as it came from the furnace, but it soon became thick; feeding rods were covered with a kish-like compound. This caused no end of trouble. Upon analysis of these irons for carbon, they were found to run much higher than any that he had used in the East, and he was obliged to greatly reduce the silicon before this difficulty was overcome. Had he made the analysis for carbon first he would have avoided this difficulty and have saved much expense.

The amount and condition of the carbon are the chief elements which regulate the qualities of an iron and make it hard or soft, strong or weak. Silicon and sulphur are elements whose usefulness consists simply in their effect upon the carbon. I am not siding with the carbon faction in a discussion of the usefulness of these two elements, but I am trying to make prominent the fact that no element can be disregarded in the mixing of iron by chemical analysis. The chief trouble with the iron made during the rush period was, that the irons were too low in carbon. An analysis for silicon would have been but little help to a founder whose iron had shrunk nor would an increase in the proportion of the silicon wholly avoid this difficulty.

"How high shall my iron run in silicon?" is often asked by founders in our trade journals. This question may be asked by a man who makes stove plate, and answered by a man who makes cylinders. No one can give the per cent. of silicon and sulphur necessary without knowing the nature of the work, the quality of the iron and the amount and the kind of scrap. All these influence the amount of silicon necessary for different mixtures. If we are to profit by the advice of others, we must limit ourselves to those who have had experience in the line of work in which we wish for information. It is only natural to think that what has been of advantage to us must be of help to others, losing sight of the fact that no two foundries do exactly the same line of work or use the same irons, and that there are hardly two cupolas in the country which melt under the same conditions.

Foundries will profit then by the use of analysis, in proportion to the intelligence shown in its practice. The founder simply deludes himself when he considers that he is able to obtain the maximum benefits when using partial analysis. A benefit derived from mixing by silicon and sulphur is but an indication of the results that may be accomplished by making use of the full analysis.

Thursday Morning Session.

On assembling, the following paper on

Melting Brass,

written by C. Vickers, of Chicago, was read:

Brass, bronze, and other copper alloys are seldom melted in contact with the fuel, as in the case of iron. Crucibles are universally used, the furnaces are simple in construction, and so well known as to need no description. Solid fuel is most generally made use of, either hard coal, or coke, coal being the best for furnaces with forced draught. Liquid and gaseous fuels are also used in melting, but will never entirely supplant the old straight

shaft furnaces. This is not because brass founders are conservative as a class, and object to change, but rather that their foundries are generally small affairs, and located in all sorts of out-of-the-way places, such as the upper floors of high buildings, and places possessing no railroad facilities. Under such conditions oil cannot be obtained at a price that will allow it to compete with coal or coke. The use of oil also in crowded cities increases fire risks. Gas may be easily obtained, but its application to brass melting requires the attention of specially skilled workmen in order to be efficient and economical. Gas, however, is an ideal fuel; it is clean, easily regulated and applied, and leaves no ashes to carry away metal, but such is the ignorance and prejudice of the average melter, that manufacturers of gas furnaces, convinced that their furnaces will never get fair treatment at the hands of these men have retired from the field in disgust, and no longer seek to place their products in the average brass foundry.

Whatever kind of furnace may be used the melting and handling of copper alloys requires the most careful supervision on the part of the management, or the loss of metal will be so great, that it plays havoc with the profits of the business. This loss is greater in summer than in winter, as the great heat to which the men are exposed saps their vitality and makes it impossible for them to stand up to their work as well as in cold weather. More metal is therefore spilled in the furnaces, and lost by oxidation. The ashes and skimmings should receive careful attention, and the recovered metal be promptly used up. The cost of melting may be greately increased by the injudicious handling of crucibles.

As the subject of crucibles has been exhaustively and ably dealt with, the writer will content himself with a few remarks on tongs, as ill-fitting tongs bring many crucibles to an untimely end. Some brass foundries habitually use tongs with only one set of straps; tongs such as this are very liable to crush the pot, especially when used for pouring. They grip the pot a little below the bilge when the lip of the pot is rested on the edge of the mold and the tongs pulled over to lip it in pouring; if the tongs do not grip with great force the leverage will cause them to slip, and this is fatal to the successful running of light work. The pressure of the tongs being great enough to hold the pot firmly, it is soon squeezed out of shape and becomes oval. This continues until a crack is developed and the further usefulness of the pot is ended. Tongs with two sets of straps are the best, one set gripping below and the other slightly above the bilge. They are very liable to warp out of shape, however, and should be fitted from time to time to a new pot. Tongs with ace of spade shaped points, the ace gripping below the bilge and the straps around the same, ought not to be used in "pulling out," as the fuel will often prevent their going to place, and the points of the ace grip the pot where they are not intended to fit and they sink into and pierce the softened pot.

To obviate these troubles furnaces have been devised from which the crucible is never removed. The metal being poured out by tipping the furnace. This is all right on heavy work, but is useless on work where the metal must be used "jumping hot," as the transference to a pouring vessel will inevitably cool it. For exceedingly light work experience has taught that small crucibles and tong pouring are the best.

It is a good idea to have two spouts to a crucible, one at right angles to the other. This second spout can be easily made with a file, before the pot is used. Then if both spouts are used alternately in pouring, the pot will retain its circular form and not be so liable to crush.

Crucibles are often broken when melting ingot copper and heavy pieces of brass, by carelessness in packing the same when the pot is charged. Each ingot should rest on the bottom of the pot and not be suspended by other ingots on the sides of the pot, otherwise when melting commences these suspended ingots are liable to act as a wedge, and in sinking burst the softened crucible.

When brass is melted with ingot copper it is often good practice to melt the brass first, placing the copper ingots on top of the pot and when hot dropping them into the melted brass. This will cut them away, bringing the heat out quicker.

F. Conlon, of South Bethlehem, read an able paper on the

Insurance of Patterns.

He referred to the importance of the subject in hand and reviewed the difficulties which foundrymen encounter in getting the proper classifications and consideration from the insurance companies in this respect. He recommended that the association take the matter up nationally and formulate regulations under which the insurance companies shall place

valuation on the patterns used in all of the foundries throughout the country. He also recommended that foundrymen keep a record of the patterns on hand showing whether they are active—that is, possessing the intrinsic value of an unused pattern upon which the production of the entire work hinges—or whether they have already been used, their cost having been charged up to the casting or finished product.

S. Groves, of Pittsburg, delivered an illustrated address on

The Engineer in the Foundry,

which was received with much favor. Mr. Groves' connection with the Westinghouse Machine Co.'s plant at East Pittsburg, Pa., where some very heavy castings are being turned out by improved methods, gave the author an excellent opportunity to show what is being accomplished in one of the leading shops of the country.

R. C. Cunningham, of Holyoke, Mass., presented the following paper on

Foundry Costs.

To the makers of molding machines we are greatly indebted for the reduction in the cost of castings, as well as for the increase in production. Now, we will take the means they use to make their machines a success and apply them on work that is to be done by hand and see if we can not arrive at almost the same results.

Every maker of molding machines claims that in order to get the greatest benefit from a machine, the patterns and core boxes must be perfect. Would it not be well for foundrymen to follow this example on all patterns sent to the foundry? If it is profitable to spend money on a machine pattern so that when it leaves the mold there is no further work to be done, would it not be much more so to have all patterns properly constructed and thus reduce as much as possible the skill that is required in hand molding?

It is the same in regard to core boxes. These should be so constructed that when a core leaves the box it will be perfect. It will not take a patternmaker any longer when doing this work to make it right than it will to do it in the slip-shod way in which we often find patterns made. I do not mean by this that a patternmaker should spend as much time on a pattern from which you want to get only one casting as he would on patterns that are to be used continuously; it is our standard patterns that we want made as well as our machine patterns. By doing this we can greatly reduce the cost of our castings. It is admitted by all that there is a limit to work that can be done on machines. Let us assume that the cost of work now done by machines is as low as can be made possible; then we will turn our attention to the patterns which are not considered practical to be used on machines. Some of the patterns are so large and complicated that it would require the services of a skilled molder to do the work; the remainder is ordered in such small quantities that it would not pay to have the patterns fitted up for machines. It is to these classes of work that the foundryman must turn his attention in order to make a still further reduction in the cost of castings.

Let us take the work that is considered too complicated for the machines. When these patterns were made, was the best and cheapest way to mold them thought of, or, did the patternmaker make the pattern the easiest way for himself, without thinking of what it would cost in the foundry? It is safe to say that in nine out of ten times the requirements of the foundry were not considered, and in consequence the cost of molding was nearly doubled. This could have been avoided had the foundry foreman been consulted, and the chances would have been that the castings could have been made at a minimum cost. If your foundry foreman is not capable of giving instructions as to how a pattern should be made to be molded at the lowest possible cost, you are standing in your own light by keeping him in that position.

A short time ago a pattern for a large bed of a pumping engine was sent to a foundry for five castings, each of which would weigh several tons. The foreman objected to the way the patterns was made, as he claimed it could be molded much cheaper if constructed in a different manner. After many arguments he was told to make one casting the way the pattern was made, then if he wished to have it changed it would be done. It took a molder and a helper seven days to make the casting. The pattern was then changed and the same men made it in four days. The cost for molding the first casting was $31.50, while the last four were each made at $18, a gain of $13.50 a piece.

Another pattern which had been used a long time and from which hundreds of castings had been made took a molder, working at the rate of $2.50 per day, a day's time to make

sixteen castings. The molder, working at this rate, would make the castings cost a little less than sixteen cents each. This pattern was changed at a cost of $3.50 and then a laborer made one hundred castings for $1.25, the cores cost seventy-five cents, making the castings cost two cents each. This work was not done on a machine. If it had been, would not the machine makers claim that the machine was the cause of this reduction? I could cite hundreds of cases similar to these, where by making a few alterations on a pattern the expense of molding was cut in half, and I think every foundryman will agree with me, when I say that more attention should be given to the construction and care of patterns.

If you will notice the condition of patterns that go into your foundry from day to day, and see the extra amount of work that has to be done on the mold to put it in the condition that the pattern should have left it, you would not be surprised at the high cost.

If our machine shop costs are greater than we think they should be, we lose no time to look for new and more modern tools with which to do the work. If our foundry expenses are high, are we not inclined to think that the foreman has been neglecting his business? Has it ever occurred to you that you are to blame for the increased cost? Are you not asking your foreman to turn out good work with poor patterns and flasks? Are you doing anything to help him reduce the cost, or are you not asking him to do work that belongs to the pattern shop? The molder has to do this work every time a casting is made from a poor pattern. Had the pattern-maker done his work properly there would have been no occasion for this extra molder's work.

Give the same attention to your foundry as you do to every other department of your works. A labor-saving appliance is as much to your benefit in your foundry as it is in your machine shop. A dollar made in your foundry is as good as one made anywhere else about your works. Because the foundry is dirty and smoky do not neglect it, give the men every convenience to do their work with, costs cannot be reduced by compelling men to work at a disadvantage. Think of this sometimes when you send into your foundry badly made and worn out patterns, and old broken castings, a few strips and sweeps, for, when such is the case, how can you expect to get nice castings made from them?

I wish to bring up another point. Are we not asking our molders to do work that a laborer could do? In the majority of shops the men commence work at seven o'clock. How many do you find molding much before eight o'clock? They have been one hour doing work that the laborers should do, while they should have been molding. The average pay for the best molder is thirty cents per hour, while the wages of the laborer is twelve and one-half cents. Every hour you have a molder cutting sand you lose 17½c. If you have fifty molders, you start off every morning by losing $8.75. How many have ever thought of this? Many are under the impression that you cannot get any more work done by having everything ready for the men when they come into the shop. If you have a molder who will not do any more work by having his sand cut up than if he had done it himself, he is not a profitable man to have in your shop, and if your foreman is unable to get any more work done by having the men commence work at seven o'clock than he could if the men had cut up their sand and had commenced work at eight o'clock, he is not the man you should have to superintend your foundry. If you furnish your foreman with patterns properly made and necessary tools with which to do the work, you certainly have a right to expect your castings made at a reasonable cost. He must plan and lay out the work for the entire shop, so that there will be no time lost, and it is his duty to see that the men have the proper rigging with which to do their work, and also to insist upon work being done in the proper manner. He should never start a job until it is ready. It is the habit of some foremen to start a job and have the carpenter bar up the flasks afterwards, while the molders are compelled to stand around and wait for him. From my experience I have learned that the majority of molders would be just as well pleased to wait for a new flask to be made after they got a job started, provided they do not lose their time.

When you have a foreman who has no system about his shop you can always look for a small production, which always means high costs. Such a man is never successful as a foreman.

To be successful, a foreman of the foundry must be a mechanic, capable of deciding any question that is brought before him regarding foundry matters, and if he should be called into the machine shop to be shown a defective casting, he should be able to tell the cause of the defect and know where to apply the

remedy, whether it be in the molding, coremaking, or cupola. A knowledge of chemistry is of great benefit to a foreman, in fact, only by knowing the chemical analysis of what goes into the cupola, can he hope to obtain the desired results. When he knows the results obtained and the chemical combination which caused them, he knows that a reproduction of the same combination under the same conditions will reproduce the same effects, or in other words, like causes will produce like results. With this knowledge he can choose irons that will produce a mixture of any desired analysis at the lowest possible cost. A foreman must be a good judge of human nature, so as to be able to manage his men in a manner that will induce respect for himself: he should never lose his temper, or make use of profane language while talking to his men; he should not have any favorites, or to stop one man from doing what he allows another to do! if he makes a rule he must enforce it, and so show his men that he is managing the shop and not they.

There is no trade that requires the skill, patience and good judgment that molding does. It is often pursued under the most wearisome conditions. The result at best is an uncertainty. Oftentimes it is several days before a defect in a casting is discovered and then not until there has been dollars worth of machine work done on it. For this reason we should have the best of everything with which to do our work. We should not be asked to "make bricks without straw," but supply us with good material of all kind, and then you can expect good results. The sooner the foundrymen realize this, the sooner they can look for a greater reduction in the cost of castings and an increase in the output from the foundry.

The paper by Percy Longmuir, of Sheffield, England, on

The Relation of the Laboratory to the Foundry,

was next considered. We reproduce the following paragraphs therefrom:

The acknowledged success of the steel works laboratory has caused many foundries to view chemical analysis as a means of controlling and regulating their mixtures and many foundries have adopted this plan with more or less success. In the older days mixing iron by fracture only met with a much larger measure of success than is possible today. The brands of iron, mostly charcoal, were fewer and they did not vary to the same extent as those the founder of today is compelled to use. Today the founder controlled by competition must utilize much cheaper irons, and this same factor compels him to turn out a casting equal in every respect to one made from a mixture of charcoal and cold blast irons. To do this by fracture only is out of the question. The deceptiveness of a fracture has been shown by many writers, and it is well known that its appearance is influenced by the rate of cooling and also the initial temperature of the iron. Further than this the same grade number of iron from different furnaces will, only in rare instances, have similar chemical or physical properties, and hence mixing by the grade number only is impracticable. There are two courses still open, and these are mixing on the results of (1) Chemical analysis; (2) Physical tests. A series of the latter can be readily conducted in any foundry, much valuable information derived therefrom and a methodical plan of mixing adopted. No matter how ingenious this system be, it still leaves much to be desired, and it is only in a combination of physical and chemical analysis that full information of the characteristics of a metal will be gained. It is to this combination that the founder of today must turn and in it will find many scientific "short cuts" to that excellence of product which means full employment and fair dividends.

The routine work of a foundry laboratory comprises the analysis of every new batch of iron, the results of which are handed on to the foundry manager, who calculates his mixtures from these results. Complete analyses are necessary; that is to say estimations of combined carbon, graphite, silicon, manganese, sulphur and phosphorus. With a laboratory at hand, all iron should be bought to specification and on conditions that if certain elements exceed or do not reach a certain percentage, the shipment is liable to rejection. Each founder must, of course, make these specifications cover his own requirements. Foundry materials, such as blackings, plumbago, etc., sands, clays, fire bricks and ganisters are examined for impurities, or in the case of facing adulterations. Fuels are examined and particular reference paid to the amounts of sulphur and ash.

The conduction of mechanical tests should come under the chemist's supervision. With cast iron these are generally limited to transverse tests, but a strong plea might be held for more tensiles, and the writer would suggest that such a test accompany each transverse test made. It is true that most of the strains cast iron has to meet in actual working life are

transverse ones, and also that this test is easily performed, but if a testing machine be at hand, a tensile test will be readily performed, the expense trifling, and the gain in information great.

Physical tests of contraction, fluidity and chill made in the foundry are reported and tabulated by the chemist. In this correlation of chemical, mechanical and physical properties lies the true secret of a perfect mastery of the mixing and melting of iron. The results of the chemist's work, correlated and tabulated are kept in such a manner as to give any desired information at a moment's notice. In the case of abnormal results the microscope reveals much information as to crystalline structure. Metals or alloys of high electrical conductivity are in request and a combination of chemical and microscopical analyses will show the path to success in this direction. This leads to the matter of experimental work, and it is hardly necessary before an association of founders to lay a plea for original research. It is a difficult matter to specify the probable results of such work, but in the first place no financial loss accrues, light is thrown on dark subjects, and paying specialties or novelties are found.

The conservative element is strong in many foundries and this accounts for much of the opposition laboratories have to meet. Changes which appear at all revolutionary are looked at with askance. The matter is not one of expediency, but rather an indifference to change from the customs bequeathed by our ancestors. In other respects foundry work is looked upon as "no class," that is as being inferior to and requiring the exercise of less judgment than other branches of the engineering profession. In a case of this kind the laboratory is regarded as being "too academic," and as having the tendency to lift the foundryman from his natural rut and place him on a plane nature never intended him to occupy. Criticisms of this kind generally emanate from a source where the idea of molding is that of ramming sand, and of melting that of throwing pig and coke into a furnace and drawing off the liquid iron from the bottom.

An objection often raised against chemical analysis is that the results are not reliable and that no two chemists return concordant analyses of the same sample. There may be more or less truth in this, but it must be remembered that drillings for analysis are often submitted in a careless manner, and many cases of varying results from different chemists can be traced to this cause. The importance of correct and uniform sampling cannot be too forcibly maintained. Cases have occurred in which drillings taken from opposite ends of a pig or even from different pigs have been sent to different analysts and the results expected to coincide. On the other hand few chemists realize their own "personal equation," and most of them have their own standards or methods. There are many inherent difficulties in the laboratory which contribute their quota to the chemist's troubles, and which, perhaps, are hardly realized by outsiders.

It is urged that many iron castings will meet all requirements if they are true to pattern, clean and solid. This may be true of a sash weight, but it is not by any means the case with castings for engine details, machine framings, hydraulic or steam purposes, nor yet with structural castings. Other properties are requisite in these cases and in this competitive age the founder's aim is to meet these requirements without recourse to expensive brands of iron. The laboratory offers a solution of this and similar problems, by means of this establishment the founder is enabled to meet any requirements in his castings in the most economical manner.

The question of technical schools was brought up by Mr. West, who moved for the appointment of a committee of three to look into the matter and report at the next meeting. Some discussion was precipitated. T. J. Best, of Montreal, Can., opened it by relating the experience of Warden King & Son, of Montreal, in the organization of a school for the men in their employ. He said that his firm spent $500 in fitting up a schoolroom for the apprentices and secured the foremen in each department to give them evening instruction. The boys were to attend three nights a week, but from the start Mr. Best said it was a failure. Not one of them could be coaxed into attending the sessions and after a considerable expenditure of money the school was abandoned. He said further that it was an extremely difficult matter to make the boys see the advantage of such schools.

S. Groves, of Pittsburg, told of what the Westinghouse interests are doing in this direction, meeting with great success in their departure. Mr. Groves suggested that all foundrymen should organize classes for the apprentices in their shops. Mr. Sadlier endorsed Mr. Groves' remarks. He said the foundryman should make his foundry the college for the training of apprentices, molders and fore-

men. Willis Brown, of Erie, Pa., on the other hand, said that he believed that the technical schools of the country will offer everything that is practical in this direction as soon as the requirements of the foundrymen are learned.

J. S. Seaman, of Pittsburg, Pa., suggested that the committee as suggested by Mr. West was scarcely needed, for the reason that this matter is under advisement by the trustees of the fund donated by Andrew Carnegie for the founding of a technical school in Pittsburg. Mr. Seaman said that the interests of the association would be looked after by the committee of the Pittsburg Foundrymen's Association, all members of this association who have been appointed to look after the interests of the foundrymen in the establishment of the new school. It was deemed best, in view of this statement, to take no further action.

Officers for the Coming Year.

The following officers were elected:

President, J. G. Sadlier, Springfield Foundry Co., Springfield, O.; Secretary, Dr. Richard Moldenke, New York; Treasurer, Thos. D. West, Thos. D. West Foundry Co., Sharpsville, Pa.; Vice Presidents: T. H. Colvin, Colvin Foundry Co., Providence, R. I.; Walter F. Prince, H. R. Worthington Co., Elizabeth, N. J.; S. D. Sleeth, Westinghouse Air Brake Co., Wilmerding, Pa.; C. L. Bauer, Warder, Bushnell & Glessner Co., Springfield, O.; E. W. Smith, Crane Co., Chicago, Ill.; E. B. Gilmour, E. P. Allis & Co., Milwaukee, Wis.; J. P. Golden, Golden Foundry & Machine Co., Columbus, Ga.; T. J. Best, Warden King & Son, Montreal, Quebec.

C. S. Bell, of Hillsboro, Ohio, introduced the following resolution, which was passed:

"*Resolved*, That the hearty thanks of this association be and are hereby extended to the local committee of the Buffalo Foundrymen's Association for their very able preparations for our entertainment, and specially would thank O. P. Letchworth for his unfaltering attention to our entertainment."

The convention then adjourned, choice of the next meeting place being left to the executive committee.

The Roll of Attendants.

The enrollment of members and guests was as follows:

W. A. Jones, W. A. Jones Foundry & Machine Co., Chicago; J. S. Seaman, Seaman-Sleeth Co., Pittsburg, Pa.; R. Moldenke, Secretary A. F. A., New York; C. S. Bell, C. S. Bell Co., Hillsboro, O.; Howard Evans, Treas. A. F. A., Philadelphia; J. Frank Dye, Newport Sand Bank Co., Newport, Ky.; O. T. Stantial, Illinois Malleable Iron Co., Chicago; F. W. Schultz, *Iron Age*, New York; John Kane, Belmont, N. Y.; E. S. Morrison, DuBois, Pa.; H. Nauert, Ridgway, Pa.; A. L. Colby, Bethlehem Steel Co., So. Bethlehem, Pa.; H. G. Byram, Byram Foundry Co., Indianapolis, Ind.; F. C. Schwoerer, Indianapolis Foundry Co., Indianapolis, Ind.; J. D. Robeson, American Glutrose Co., Camden, N. J.; J. J. Bever, Otis Steel Co., Ltd., Cleveland; J. P. Winlock, Barbour-Stockwell Co., Cambridge, Mass.; A. W. Link, Erie Foundry Co., Erie, Pa.; A. Carpenter, A. Carpenter & Sons Foundry Co., Providence, R. I.; David Reid, Saco & Pettee Machine Shops, Biddeford, Me.; W. G. Rothwell, General Electric Co., Schenectady, N. Y., D. F. Eagan, H. E. Pridmore M. M. Co., Chicago; J. D. Smith, J. D. Smith Foundry Supply Co., Cleveland; M. F. Gallagher, New York Air Brake Co., Watertown, N. Y.; F. S. Cadwell, Hill & Griffith Co., Cincinnati; A. W. Bair, C. M. & St. Paul R. R., Milwaukee, Wis.; Stanley G. Flagg, Stanley G. Flagg & Co., Philadelphia, Pa.; H. Hansen, *The Foundry*, Cleveland; C. B. Reed, Parlin & Orendorff Co., Canton, Ill.; E. B. Gilmour, E. P. Allis Co., Milwaukee; D. Fraser, Chain Belt Co., Milwaukee; R. S. McPherran, E. P. Allis Co., Milwaukee; W. A. Draves, Northwestern Malleable Iron Co., Milwaukee; W. B. Hosford and H. L. Bell, Dodge Mfg. Co., Mishawaka, Ind.; G. H. Lincoln, Geo. H. Lincoln Co., Boston; R. Blyth, Walker & Pratt Mfg. Co., Watertown, Mass.; F. H. Holt, Watt Mine Car Co., Barnesville, O.; J. F. Lanigan and Wilhelm Lanigan, Lawrence, Mass.; F. S. Phelps, H. E. Pridmore, Chicago; S. D. Tompkins, Smooth-On Mfg. Co., Jersey City; J. Magee, Magee Furnace Co., Boston; I. W. Winchester, Magee Furnace Co., Boston; Chas. N. Choate, Bridgeport Deox, B. & M. Co., Bridgeport, Conn.; B. M. Shaw, Walker & Pratt Mfg. Co., Boston; Wm. Hanson, Pennsylvania Iron Works, Philadelphia; J. C. Ford, Frankfort, Mich.; B. T. Bacon, Pickands, Brown & Co., Chicago; J. F. Mills and J. F. Mills, Jr., Abendroth Bros., Port Chester, N. Y.; Willis Brown, Walker Foundry Co., Erie, Pa.; Thos. D. West, T. D. West Foundry Co., Sharpsville, Pa.; T. J. Best, Warden King & Son, Montreal, P. Q.; H. McPhee, Bridgeport, Conn.; W. J. Shennan Bethlehem Steel Co., Bethlehem, Pa.; C. L. Prince, General Electric Co., Schenectady, N. Y.; W.

H. Knowles, Ottawa, Ill.; J. A. Walker, Joseph Dixon Crucible Co, Jersey City; H. J. Rober and H. Lamp, Bettendorf Metal Wheel Co., Springfield, O.; D. Gallagher, Hecla Graphite Co., Easton, Pa.; R. M. Barnett, Brass Founders' Supply Co., Newark, N. J.; Geo. B. Buckingham and H. P. Buckingham, Arcade Malleable Iron Co., Worcester, Mass.; J. J. Burgen, Lane Mfg. Co., Montpelier, Vt.; W. S. Pattin and D. P. Pattin, Pattin Bros. Co., Marietta, O.; J. G. Sadlier, Springfield Foundry Co., Springfield, O.; A. I. Findley, *Iron Trade Review*, Cleveland; E. S. Gaylord, J. D. Smith Foundry Supply Co., Cleveland; Wm. Yagle, Wm. Yagle & Co., Pittsburg; Robt. A. Walker, *Iron Age*, Pittsburg; J. A. Meighan, Dawson Bros. & Meighan, Pittsburg; J. A. Logan, Jones & Laughlins, Pittsburg; D. J. Thomas, Sterritt & Thomas Foundry Co., Pittsburg; S. D. Sleeth, Westinghouse Air Brake Co., Pittsburg; F. H. Zimmers, Union Foundry & Machine Co., Pittsburg; J. S. McCormick, J. S. McCormick Co, Pittsburg; J. McLaren, Phillips & McLaren, Pittsburg; S. Groves, Westinghouse Machine Co., Pittsburg; E. B. Price, Wheeler Foundry Co., Worcester, Mass.; E. J. Lyon, Brown and Sharpe Mfg Co., Providence, R. I.; Theo. H. Colvin, Colvin Foundry Co., Providence, R. I.; A. W. Walker, Walker & Pratt Mfg. Co., Boston; H. E. Asbury, Enterprise Mfg. Co., Philadelphia; J. Ormrod, Donaldson Iron Co., Emaus, Pa.; W. M. Fitzpatrick, S. Obermayer Co., Cincinnati; W. F. Prince, H. R. Worthington, Elizabeth, N. J.; P. R. Ramp, C., B. & Q. Foundry, Aurora, Ill.; E. J. Sherwin, Cuyahoga Falls, O.; W. N. Gartside, Diamond Clamp & Flask Co., Richmond, Ind.; W. E. Warner, E. C. Stearns & Co., Syracuse, N. Y.; J. S. Kingsland, Buffalo Foundry Supply Co., Buffalo; H. L. Swartzenberg, Cleveland; John Hill, Hill & Griffith Co., Cincinnati; A. O. Backert, *Iron Trade Review*, Pittsburg; J. W. Busch, Pratt & Cady Co, Hartford, Conn.; I. R. Baer, Anniston, Ala.; W. H. Coffin, T. P. Kelly & Co., New York; E. A. Pridmore, H. E. Pridmore, Chicago; Geo. G. Hood, Roberts Machine Co., Collegeville, Pa.; S. T. Johnston, S. Obermayer Co., Chicago; C. D. Koch, Wm. Sellers & Co., Philadelphia; W. W. Sly, Cleveland; T. H. Morcom, Colorado Iron Works, Denver; C. H. Lewis, Cherry Valley Iron Co., Pittsburg; E. P. Osgood, Osgood & Witherby, Boston; J. W. Conway, Hartford Foundry Co., Hartford, Conn.; L. S. Brown, Springfield Facing Co., Springfield, Mass.; W. C. Free, Rockford, Ill.; D. S. Drysdale, Illinois Sewing Machine Co., Rockford, Ill.; Chris J. Wolf, L. Wolf Mfg. Co., Chicago; E. W. Smith, Crane Co., Chicago; W. Nygren, Frances & Nygren, Chicago; R. J. Cleveland, Cleveland & Barr, Chicago; C. H. Green, C. H. Green & Co., Syracuse, N. Y.; E. H. Mumford, Tabor Mfg. Co., Philadelphia; T. B. Ward, Manning, Maxwell & Moore Cleveland; J. A. Kittiesen, Moline Scale Co., Moline, Ill.; W. B. Cleveland, Cleveland & Barr, Chicago; C. J. Wiltshire, Gates Iron Works, Chicago; A. M. Thompson, Link Belt Machinery Co., Chicago; A. K. Beckwith, Beckwith Estate, Dowagiac, Mich.; H. M. Ramp, Crescent Iron Works, Springfield, Mo.; Geo. Wiard, Wiard Plow Co., Batavia, N. Y.; E. J. Lambert, Syracuse Chilled Plow Co., Syracuse, N. Y.; Phil C. Smith, Ingersoll-Sergeant Drill Co., Easton, Pa.; W. D. Trabue, Phillips & Buttorff Mfg. Co., Nashville, Tenn.; Auguste J. Rossi, New York; J. G. Armstrong, Struthers & Wells Co., Warren Pa.; H. Cordingly, Queen City Foundry Co., Denver, Col.; J. J. Lawlor, Brooklyn, N. Y.; F. E. Lonas, Maywood Foundry & Machine Co., Chicago; W. S. Morehouse, Rumsey & Co. Ltd., Seneca Falls, N. Y.; R. F. Mickle, Philadelphia Pneumatic Tool Co., Philadelphia; Sumner E. Brown, Springfield Facing Co., Springfield, Mass.; C. L. Tittle, Blairsville, Pa.; Simon Kemp, Catasauqua, Pa.; A. F. Koons, Webster, Camp & Lane, Akron, O.; C. M. Helme, Hall & Sons, Buffalo; S. W. Spear, East Buffalo Iron Works, Buffalo; Robert C. Hickok, H. G. Trout & Co., Buffalo; A. E. Doak, Whitehead Bros. Co., Buffalo; H. S. Madden, Howard Iron Works, Buffalo; Albert Hoppin, Edw. P. Allis Co., Buffalo; Chas. G. Shepard, Buffalo; O. P. Letchworth, Pratt & Letchworth Co., Buffalo; Henry W. Wendt, Buffalo Forge Co., Buffalo; P. M. Ginther, J. Ginther's Sons, Buffalo; E. C. Neal, Weed & Co., Buffalo; E. J. McCartney, Beals & Co., Buffalo; Pemberton Smith, New York Car Wheel Works, Buffalo; F. C. Mosedale, M. A. Hanna & Co., Buffalo; E. G. Felthousen, Acme Steel & Malleable Iron Works, Buffalo; E. P. Mooney, Ingersoll-Sergeant Drill Co., Cleveland; L. A. Denton, Buffalo; H. A. Boyd, Whiting Foundry Equipment Co., Buffalo; E. C. Lufkin, Snow Steam Pump Works, Buffalo; C. W. Jones, Rosedale Foundry Co., Allegheny, Pa.; E. R. Burroughs, Herendeen Mfg. Co., Geneva, N. Y.; J. J. Lawler, Lawler Iron Works, Buffalo; S. F. McRoberts, *American Manufacturer*, Pittsburg; F. Carrick, Globe Iron Foundry Co., Erie, Pa.; M. T. Hand, Philadelphia Pneumatic Tool Co., Philadelphia; Wm. H.

Steinkamp, Abendroth & Root Mfg. Co., New York; Robert B. Thomson, Buffalo Forge Co Buffalo; O. R. Roenius, Grand Rapids, Wis.; H. J. Scott, Struthers-Wells Co., Warren, Pa., S. H. Baird, S. H. Baird & Co. Buffalo; C. G. Robinson, Peru Steel Castings Co., Peru, Ind.; James A. Beckett, Walter F. Wood Mowing Machine Co., Hoosick Falls, N. Y.; Henry E. Pridmore, Chicago; B. F. Chambers, E. P. Allis Co., Buffalo; F. H. Chamberlin, J. D. Smith Foundry Supply Co., Cleveland; H. F. Frohman, S. Obermayer Co., Cincinnati; D. C. Warren, *The Foundry*, and *The Iron Trade Review*, New York; James Gorman, Lawrence, Mass.; J. C. Bradley, Pratt & Letchworth Co., Buffalo, N. Y.; S. H. Baird, S. H. Baird & Co., Buffalo, N. Y.; E. C. Lufkin, Snow Steam Pump Co., Buffalo, N. Y.; F. H. Smith, Akron, O.; F. G. Hogland, Ill. Sewing Machine Co., Chicago; Wm. Chambers Garden City Sand Co., Chicago; Jacob Krisher and Perry A. Krisher, Akron, O.; D. T. Evans Mt. Carbon Co., Powellton, W. Va.; F. E. Gordon, Ohio Sand Co., Conneaut, O.; Henry Cross, Chambers Bros. Co., Philadelphia; Geo. H. Weaver, Dominion Foundry Supply Co., Montreal; Alex. Jarecki, Jarecki Mfg. Co., Erie, Pa.; U. E. Kanavel, E. M. Ayers, Zanesville, O.; John A. Penton, *The Foundry*, Cleveland; Ernest Wiard, Wiard Plow Co., Batavia, N. Y.; Chas Jacobson, Jacobson Machine Co. Warren, Pa.; Rudolph Wegelin, Bessemer F'dy & Mach. Co., Bessemer, Ala.; Chas. Clarage, Thos. Clarage & Son, Kalamazoo, Mich.; Fred N. Conlin, Bethlehem F'dy & Mach. Co., Bethlehem, Pa.; Phillip Carroll, Carroll Foundry, Houghton, Mich.

Convention Echoes.

The Buffalo hotel people just now believe in the maxim "*Do Others.*" They do it well too.

The spirits inhabiting the Midway howled with delight as soon as Pridmore's fat boy Eagan passed into the grounds of the Exposition.

J. D. Smith made dates with the visitors as far ahead as December 31, 1907. J. D. always looks forward.

The Obermayer Souvenir could not be hidden. It was seen everywhere.

It is to be regretted that there are not more Letchworths in the foundry business.

Samuel W. Spear made everyone feel at home from start to finish.

The Buffalo Foundrymen know where the cool spots in their city are located.

All the past presidents of the association were on hand with the exception of Francis Schumann. Bell, Seaman and Jones, the balance, were on hand early.

The sympathies of those attending the convention were wired to C. A. Sercomb, of Milwaukee, who, after being a foundryman for forty years, has entered the soap business as a manufacturer.

E. C. Stearns & Co., of Syracuse, N. Y., showed one of their molding machines at the convention

The J. S. McCormick Co. presented visitors with a nice souvenir in the shape of a match safe. McCormick's lithographs of previous meetings were also much in evidence.

The Blundell Sand Mixer was exhibited at the foundry of the Noye Mfg. Co. by the J. D. Smith Foundry Supply Co.

The Obermayer Company had a Hanna Pneumatic Screen Shaker at the convention but lack of facilities prevented them from showing it in operation.

The Philadelphia Pneumatic Tool Company showed their rammers at Section 35, Machinery and Transportation Building.

L. S. Brown, of Springfield, Mass., gave his friends an aluminum letter opener.

On behalf of the J. W. Paxson Co., Mr. Howard Evans distributed a neat card case among the delegates.

Henry E. Pridmore remembered those present with a daily reference book.

Among the Foundries.

The Macpherson Switch & Frog Co. has been organized at Niagara Falls, Ont., with a capital of $250,000 to carry on a general foundry and railway supply business. The incorporators are Edward Bayley, E. R. McHolm, and H. D. Graham.

The Root & Van Dervoort Eng. Co. has begun operations at its new plant in East Moline, Ill.

The Reliable Foundry Co. has been organized at Quincy, Ill., by C. W. Sahland, A. Weibmer and C. Becker of the Weibmer-Becker Machine Co. William J. Reese will be the superintendent. The company has leased the foundry formerly operated by the Gardner Governor Co. and is refitting this with modern appliances. All kinds of heavy and light gray iron machine castings and architectural work will be made, as well as brass, bronze, copper, aluminum, white metal and composition castings.

The Otis Elevator Co. is completing a new foundry for its western works at 35th St. and Ashland Ave., Chicago.

The Quincy Engine Co., recently incorporated at Quincy, Ill., with a capital of $250,000, has begun the erection of a large foundry and machine shop for the manufacture of Williams-Corliss engines.

The Gardner Governor Co., of Quincy, Ill., has built a new foundry 200x150 feet, having a capacity of thirty tons daily.

National Foundry Co., Erie, Pa., have greatly increased their capacity of late for making heavy machinery castings by the installation of an electric traveling crane of 30 tons capacity in their foundry No. 1. This building is 250 ft. by 110 ft., having a large molding floor and with the new and very large core oven recently built, together with excellent railroad track facilities, this company is well equipped to take care of their large foundry trade.

Thomas Hewitt's Sons & Co. will erect a new foundry 100x70 ft. at East Newark, N. J.

O. P. Chatfield is erecting a brass foundry at Marinette, Wis., remodeling the buildings on a site recently leased.

The McConway & Torley Co. is having a steel foundry erected adjoining its malleable plant at Pittsburg. The building will be 85x300 feet.

Baker & Shevlin, machinists and founders, at Saratoga Springs, N. Y., have incorporated under the name of the Baker & Shevlin Co. The new company will continue the manufacture of pulp and paper mill machinery as heretofore. A new plant will be erected, consisting of machine shop, foundry, etc., the buildings of which will be of brick and iron construction, equipped with all modern conveniences.

The Central Foundry & Machine Co., of Reading, Pa., has been incorporated with a capital of $7,000. L. M. Francis, H. C. Urich, E. L. Francis, P. A. Bushong and J. H. Cheetham are the incorporators.

The American Steel Foundry Co., of St. Louis has purchased the Sligo Furnace in Dent County, Mo., and will manufacture its own charcoal pig iron.

The Baltimore Foundry Co., recently incorporated, has purchased the interests of J. P. B. Sadtler & Co., 813 South Howard street, Baltimore, Md., and intend doing a general foundry business, including fine gray iron and brass castings, etc. Later they expect to take up the manufacture of gas stoves, etc. The officers are Frank Popplein, president; J. Carroll Ahearn, secretary, and Harry W. Woollen, treasurer.

The Depenet Foundry Co., successors to the Chicago & Erie Stove Works, have incorporated, with a capital of $30,000, paid in, and have leased the foundries at Erie, Pa., formerly used by the Erie Car Wheel Foundry, and intend to do jobbing work, manufacturing gray iron castings.

The Youngstown Brass & Iron Foundry Co. has been organized at Youngstown, Ohio, and will remodel and enlarge the Morrison Foundry & Machine Works in that city. The new concern will do a general foundry and machine business, but expect to make a specialty of brass and bronze castings for rolling mills, sheet and tin mills. They will also make gray iron castings. The Youngstown Brass & Iron Foundry Co. are an outgrowth and consolidation of the Morrison Foundry & Machine Co. and the Youngstown Brass & Bronze Works of Youngstown. R. D. Gibson is president, J. W. Morrison, Jr., vice-president and general manager, and Robert Kelly, Jr., secretary and treasurer.

The Harriman Metal Bedstead & Mfg. Co., Harriman, Tenn., in addition to manufacturing bedsteads regularly, also make street service boxes for water works, iron shoe lasts and stands, brake shoes and brake heads, M. C. B. standard, heavy railroad stoves and self-oiling car wheels. They are also ready to make new things to order and do general machine repairing. The president is E. B. Goodbee; vice president, L. Ephraim, and general manager, David Gibson.

The Betts Machine Co., Wilmington, Del., makers of metal working and machine tools, are building an addition to their foundry which will double the capacity. Two electric traveling cranes and all other modern appliances are being installed, at an approximate cost of $20,000.

The Clyde Iron Works, Duluth, Minn., have started up under new control, after a short idleness, caused by the failure of the company, who had been conducting them. They will employ about 100 men.

The Buckeye Malleable Iron & Coupler Co. has begun the construction of their new plant at Columbus, Ohio, plans for which were prepared by the Wellman-Seaver Engineering Company of Cleveland. This will cover 20 acres and will consist of nine buildings in all, which, with the equipment, will cost about $500,000. Two of the structures will be 100

x 750 feet and 50 feet high. There will be five furnaces, each of which will cost about $20,000, and all carrying work will be done either by steam, electricity or compressed air. Power will be furnished by two Corliss engines of 300 horse-power each. The company will establish their own electric light and power plant, and will build railroad tracks and switches on their grounds. These improvements will double their present capacity and when in full operation the works will employ about 1,000 men. Besides the manufacture of malleable iron castings and the Little Giant Buckeye coupler, the company intend making all kinds of car castings of both malleable iron and steel. It is expected that a part of the new works will be in operation by January 1 next. Samuel P. Bush will assume the duties of superintendent.

Fuller Iron Works, Providence, R. I., are removing the old portion of their foundry, which has been in continuous use since 1840, and are replacing it with a brick and steel structure, 92 x 92 feet, and an ell, 40 x 60 feet. The American Bridge Co., Berlin branch, have the contract for the steel, and the Cleveland Crane & Car Co. will supply the equipment of electric traveling and jib cranes.

The firm of Hartley & Wilber of the Oakville Foundry Co., Oakville, Ind., has dissolved. H. D. Hartley will continue the business, Mr. Wilber retiring.

The Lobdell Car Wheel Co., Wilmington, Del., are erecting an addition to their foundry in the shape of a cupola house. A new cupola, with a melting capacity of 25 tons per day, is also being erected.

The new wheel foundry buildings of the New York Car Wheel Works, Buffalo, N. Y., to replace those destroyed by fire on March 6, are now practically completed and have a capacity of 500 wheels per day. The temporary foundry which was erected in place of one of the old foundries destroyed has a capacity of 250 wheels per day, which will give altogether a daily output of 750 wheels. The new buildings were erected by the Structural Iron & Steel Co., of Baltimore, Md., who made remarkably good time, the order having been given to them in the first week of April, and the steel structure of the new foundry having been put together at their works, shipped to Buffalo and erected within eight weeks thereafter.

The foundries of Southern California are experiencing quite a boom. Axelson Bros. are erecting a new foundry at Los Angeles, and the Fulton Engine Works of the same city are also putting up an extension, which will make their foundry one of the largest in the city.

The Tampa (Fla.) Foundry & Machine Co. is erecting a new machine shop, 50x100 feet. A new foundry and office building is also under construction. S. L. Varnedoe is president.

The Southern Brass & Iron Co., Knoxville, Tenn., dealers in machinery and mill supplies, has decided to engage extensively in the manufacture of dynamos and motors, which they expect to have on the market for fall business.

Charles Miller has leased the foundry and machine shop of the Gunzenhauser Iron Works, Muscatine, Iowa. Mr. Miller was for five years master mechanic for M. Guggenheim & Son's operations in Mexico.

The Acadia Iron Works, Crowley, La., is again enlarging their plant by the erection of an addition, 50 x 200 feet.

The Harrisburg Mfg. & Boiler Co., of Harrisburg, Pa., is erecting an addition to their boiler shop, 80 x 205 feet, which will be equipped with machinery of latest design, especially for the manufacture of riveted sheet steel pipe and tank work for export business. They are also erecting an addition to their foundry, 65 x 100 feet, which will be equipped with traveling crane, new cupolas, etc. These additions, with their present plant, will increase their working force to 200 employes.

The Columbia Foundry, Eagle street and Newtown Creek, Brooklyn, N. Y., is now being operated on the same principle as before, with George Leary as manager.

Among recently organized corporations in Wisconsin are the Oshkosh Malleable Iron Co., Oshkosh, with a capital of $100,000, to make malleable and other castings. The incorporators are Elmer Leach, C. A. Libbey and J. J. Stevenson, all connected with existing important manufacturing operations.

A. Bostick & Sons, manufacturers of agricultural implements and stoves, Millington, Mich., have agreed with the Board of Park and Improvement Committee of the city of Lapeer, Mich., to locate their works in Lapeer for a term of ten years, and will receive the sum of $10,000 for the removal. Ground has been broken for the buildings. They will have a foundry 80 x 120 feet, to be of brick, one story high, and will also have a brick power house, while other buildings will be of frame construction. They expect to be ready for work in their new quarters by the middle

of August. They at present manufacture agricultural implements and the Tidal Wave and Banner cook stoves, but are getting patterns ready for air tight stoves and steel ranges.

I. T. Robinson has purchased from President J. E. Bell one-half of his interest in the Carthage Foundry Co., Carthage, Mo. Mr. Robinson has been elected vice president and general manager, Mr. Bell retiring from active management.

The Ohio Pump & Brass Co., Columbus, O., was recently incorporated with a capital of $50,000. The company will make a specialty of hydraulic water lifts, plumbers' brass goods and specialties. They have ample facilities and are prepared to fill all orders promptly. Thomas E. Knauss is president and John Cummings treasurer.

The Bordo Valve Co., 113 North Twelfth street, Philadelphia, has removed its main office and works to Coatesville, Pa. Their new plant will be thoroughly equipped with up to date machinery and tools, and they are prepared to do strictly first-class work in brass casting and machine work.

The Detroit Galvanizing & Sheet Metal Works, Detroit, Mich., has recently sold its foundry and steel range department to the Detroit Steel Range Co., a corporation recently formed, consisting of some of the stockholders of the older company and several parties of experience in the stove line.

A number of independent coal operators and coke makers in Western Pennsylvania, Eastern Ohio and West Virginia have organized the Tri-State Coal & Coke Co., with a capital of $100,000. The offices of the new concern are in the Lewis Block, Pittsburg. The company has purchased a number of coal properties near Latrobe, in Westmoreland county, and some along the Youghiogheny river. On these properties are 250 coke ovens, but more will be built this summer. The company expects to market 1,000,000 tons of coal and coke yearly. T. J. Easter is president of the new concern; Wm. Harris, vice president; G. W. Eisenbeis, treasurer, and Roy Wise, secretary.

William C. Shafer has leased the Conneaut Foundry, Conneaut, Ohio, and will continue the jobbing business heretofore carried on by that firm.

John McEwing is adding a foundry to his machine shop at Circleville, Ohio.

The Independent Novelty Co., of Niles, O., has just finished building a 30 x 40 foot structure, to be used as a brass foundry, and will begin at once the erection of a two-story building, 40 x 60 feet, to be used for finishing and storage room.

G. T. Glascock & Sons, Greensboro, N. C., have purchased the Piedmont Iron Works. They will continue the architectural iron work formerly done by the Piedmont works and will also do a general jobbing machine and foundry business at that place, confining their present establishment to the manufacture of stoves, hollow ware, grates, etc.

F. D. Beaupre & Co. have built a new foundry at East Concord, N. H., and are prepared to make all kinds of metal castings.

The Aurora Foundry & Machine Works, Aurora, Mo., has incorporated with a capital of $75,000 to continue the manufacture of mining machinery. The officers are C. H. Cole, president and treasurer; Jared R. Woodfill, Jr., vice president; Loy T. Le Bow, secretary, and C. C. Mathey, manager.

F. C. Austin Mfg. Co., of Harvey, Ill., manufacturers of dirt moving machinery, will establish a branch at Houston, Texas, which will be under the management of E. H. Heaton.

The Girard Foundry & Machine Co., Girard, Ohio, have incorporated with a capital of $10,000, to do a general foundry and machine business. Plans are under way for the construction of an entirely new plant.

T. Murphy, proprietor of Jacksonville Machine & Iron Works, iron and brass founders and machinists, Jacksonville, Fla., whose plant was destroyed by fire, has temporary buildings up and is now making castings. New tools and machinery are on the way, and in a few days the machine shop will be in operation. Later on new and modern shops will be erected.

The directors of the new Reading Foundry Co. met at Reading, Pa., and elected: President, F. W. Ayer; vice president, Peter D. Wanner; treasurer, John W. Storb; secretary, F. A. McDermond. Plans are being pushed forward as rapidly as possible, so that the works will resume operations in the latter part of June.

Borger Bros. & Co., of Columbus, Ohio, are about to erect a new boiler shop about 80 x 500 feet, with 40 feet clearance. A 50-ton traveling crane will be installed. A new foundry will also be erected 50 x 180 feet, and of steel construction.

The William Tod Co., engineers, founders, and machinists, Youngstown, Ohio, have under way a foundry 80 x 250 feet, with a crane runway extension of 100 feet, and a leanto 40 x 250 feet. The main building will be 42 feet

6 inches high, and will be equipped with three 30-ton and two 5-ton electric traveling cranes with 80 foot span. The height of the leanto will be 31 feet 6 inches, and this will be equipped with one 5-ton 38 feet span electric traveling crane, and in other respects the building will have all the modern appliances known to the trade.

The Dearborn Brass Co., of Cedar Rapids, Ia., are incorporated; the capital is $13,500. The incorporators are, Frederick Erickson, Louis Kruber, C. S. Johnson, J. A. Chandler and W. H. Dunshee.

D. M. Osborne & Co., manufacturers of harvesting machinery and agricultural implements, will build an addition of several hundred feet to their foundry at Auburn, N. Y. The wall of the present foundry facing on Mechanic street is also to be rebuilt.

The Brylgon Foundry at Harrisburg, Pa., has been placed in operation. This company will manufacture steel castings up to 15 tons in weight.

Kimball Bros. have formed a stock company with the Omaha Electrical Works, and under the name of the Kimball Brothers' Company will continue the manufacture of passenger and freight elevators, to which they will add the manufacture of electric motors. Their works at Council Bluffs, Iowa, will be improved so that they will be better able to fill orders promptly.

A. L. Ide & Son, of Springfield, Ill., are erecting a new foundry to be fully equipped with all modern appliances for the handling of engine castings.

W. C. Russell and L. W. Lester will start the foundry at Glencoe, Minn., which has for some time been idle.

R. E. Saunders, proprietor of the North Wisconsin Boiler Works and Foundry at Ashland, Wis., has completed his plant.

A. Buchs Sons, manufacturers of farm machinery, cast and steel troughs, special castings, etc., have outgrown their present plant at Elizabethtown, Pa., and are now erecting an entirely new one, which will consist of a wood working department, 50 x 200 feet, with a wing 30x26 feet; foundry, 54x96 feet, with a wing 37 x 32 feet; machine, erecting and painting department, 40 x 264 feet; warehouse and office, 150 x 50 feet, two stories; pattern house, 32 x 30 feet, and dry house. Two side tracks will be run into the works, one for loading and one for unloading materials. Machinery of latest design and other modern appliances are being installed. When completed the plant will be up to date in every respect and the firm will be in a better position than ever to take care of their increasing trade.

The Goetz & Brada Mfg. Co., 18 to 24 Michigan street, Chicago, will soon commence to erect a plant on the land which was recently purchased by them at Chicago avenue and Sangamon street. The factory will comprise a main building, 115x210 feet, and a boiler and blacksmith shop, each 30 x 60 feet. The large building will be of brick and steel, and will be four stories high. The first floor will be occupied by the tank shop, the second by the machine shop, the copper department and offices will be located on the third story, and the brass foundry and finishing room on the fourth floor. All the departments and shops will be equipped with the latest appliances, and the cost of the land and the buildings alone will aggregate $100,000. The company hope to have their plant in operation by September of the present year.

The Grand Rapids Brass & Iron Bed Co., Limited, has been incorporated with a capital of $70,000, to engage in manufacturing at Grand Rapids, Mich. They have purchased a plant formerly used for another line of manufacturing and will remodel it for their purpose, adding buildings for a foundry and other necessary departments, which they expect to have ready for occupancy about July 1. Meanwhile they will conduct business in the building hitherto used by the Brass & Iron Bed Co., dissolved. G. W. Perkins is chairman, Addison A. Barber, vice chairman; E. P. Chamberlin, secretary; and C. F. Rood, treasurer. The general superintendent is J. W. Williams, who has been connected for 18 years with the Simmons Mfg. Co., Kenosha, Wis.

The Atlas Foundry, Carroll avenue and Leavitt street, Chicago, which was operated by the Atlas Foundry Co., has been closed, and a receiver appointed for the company.

C. O. Hart, representing a new corporation under the name of the United States Steel Castings Co., has purchased a large tract of land at Chicago Heights, Ill. The identity of those interested in the new company has not been disclosed, but they are stated to be partly domestic and partly foreign capitalists. The plant will be an extensive one, as the main building will be 300 x 700 feet.

The Chicago Hardware Foundry Co., whose main offices and plant are situated at North Chicago, Ill., are just completing the erection of a foundry building 65 x 80 feet. They are

about to commence construction on a brass foundry 40 x 60 feet, which will be used as their general brass department. They manufacture special gray iron and brass castings. John Sherwin is president and E. P. Sedgwick is secretary and treasurer.

The N. S. Sherman Machinery Co., Oklahoma City, Okla., founders and machinists, will erect a foundry with several times the capacity of their present one, and will be in the market for cupola, supplies, etc. They will also erect a large warehouse and do a jobbing business in machinery supplies.

J. C. Shepard is organizing a stock company at Gallipolis, Ohio, to operate a foundry. Wharf property 350 feet front has been secured upon which the company propose to erect a building 60 x 350 feet, to be used for molding room.

North Wisconsin Boiler Works & Foundry, Ashland, Wis., brass and iron castings, are building a new foundry, 40 x 100 feet, which is expected to be completed early in June.

The Carbondale Metal Works Co. is being organized at Carbondale, Pa., with a capital of $30,000. They will occupy a plant 72 x 200 feet, which will be equipped for the manufacture of stoves, furnaces, hot air, hot water and steam heaters and commercial iron generally. The plant is expected to be in operation by August 15.

The Central Machine Works Co., of Minneapolis, Minn., is erecting a new plant. The foundry has been completed.

The Kenyon foundry property, at Steubenville, Ohio, has been purchased by Samuel Irwin, who will erect a foundry, boiler shop and machine works, employing seventy-five hands.

Jones & Bixler Mfg. Co., Freemansburg, Pa., who recently incorporated, have succeeded to the iron toy manufacturing business formerly carried on by Jones & Bixler. Increased business has necessitated the enlargement of their plant, and they are building an addition, 45 x 90 feet, to the wareroom and an enameling room 24 x 36 feet.

The American Steel Foundry Co., at Granite City, Ill., has begun work on an addition to its finishing and foundry departments that will cost in the neighborhood of $15,000. The increase in the manufacturing facilities was made necessary by large orders recently received, and an additional force of several hundred men will be employed as soon as the new departments are in operation.

The Denver Wire & Iron Works Co., of Denver, Colo., contemplates the building of a foundry for doing its own work. Frank White is manager of the company.

The Central Foundry Co. has been incorporated at Fort Wayne, Ind. The capital stock is $20,000, and the incorporators are Frank J. and Henry B. Bercot, Christian C. and William C. Walda and Frank J. Belot. The company will manufacture an adjustable iron sashweight patented by William C. Walda.

The Ohio Foundry Co. has purchased the plant and business of the Union Foundry Co., at Dayton, O. The new company will continue the manufacture of light and heavy iron castings on a larger scale, and if business justifies it it is the intention of the new concern to considerably enlarge the present plant. J. A. Gauthier is president.

The Simpson Iron Co., Columbus, Ohio, recently moved to new and larger shops. The company now have ample room for the manufacture of small castings, the foundry being large and well lighted. The chief business of this concern is to supply the various novelty manufacturers with small castings. The concern supplies the Hallwood Cash Register Co. with all the castings they use. The force of men employed by the Simpson Iron Company is being steadily enlarged.

The Fort Wayne Foundry & Machine Co., Chicago, is about to remove its plant to Forty-third and Wood streets. Plans are being considered for two foundries, each 100 x 300 feet, an engine room and a blacksmith and machine shop. When completed, this will be one of the largest plants in Chicago.

The Arcade Mfg. Co., Freeport, Ill., has purchased the toy business of the Coleman Hardware Co., Chicago, and is making preparations to supply this line of goods to the trade in addition to their own lines as heretofore.

The Marine Engine & Machine Co. is enlarging its works at Harrison, N. J., by the erection of a foundry, 175 x 100 feet, with an ell 50 x 75 feet, which will be equipped with electric and pneumatic cranes and other modern devices for the manufacture of heavy iron castings.

The Charles Hegewald Co., of New Albany, Ind., has purchased additional ground and will enlarge its foundry and machine shop.

The Blacklock Foundry, of South Pittsburg, Tenn., is increasing its molding floor space and will install cupolas of larger dimensions than those now in use.

The Duffy-Trowbridge Stove Mfg. Co., Hannibal, Mo., is building an addition 80 x 160 feet.

The Scranton (Iowa) Foundry has been placed in operation after a lengthy shut down.

The Norris Scale Co. has completed its plant at Marshalltown, Iowa.

Lang & Scharmann will erect a new foundry at Marshfield, Wis.

The Reese Brass Foundry Co., Quincy, Ill., succeeds W. J. Reese & Co. The facilities will be enlarged.

Williams & Ward will establish a brass foundry at Houghton, Mich.

The Dobbie Foundry & Machine Co., of Niagara Falls, N. Y., has been organized. A. T. Throop has been succeeded as general manager by John Dobbie, and Walter McCulloh as secretary by Fred Wiard. Both Mr. Throop and Mr. McCulloh tendered their resignations as officers but remain as directors. In the re-organization J. Challis Jones is treasurer.

The Lennox Machinery Co., Marshalltown, Iowa, has purchased additional land adjoining its plant and has begun the erection of a brick building, 64 x 120 feet, to be used as a foundry. The company already have a molding shop, and the addition will double their capacity for the manufacture of castings.

The Charleston Stove Foundry has built a new plant at Charleston, Tenn. G. L. Saulpaw is president; H. H. Edwards, secretary, and Charles N. Redenburg, superintendent.

Plans are being prepared for an addition to the plant of Wahle Foundry & Machine Co., Davenport, Iowa.

The foundry of the Wenzelmann Manufacturing Co., at Streator, Ill., which was lately destroyed by fire, is being replaced by a new structure, 60 x 60 feet.

The Matteawan Steel & Iron Co. is a newly organized concern which will erect a foundry at Matteawan, N. Y.

The Williams Foundry & Machine Co. has been incorporated at Akron, O., with a capital stock of $50,000. The incorporators are, J. K. Williams, A. J. White, D. P. Wheeler, Harvey Musser and Robert Patterson.

C. K. Stockland has started a foundry at Stephen, Minn.

The Chapman Valve Mfg. Co. is extending its brass foundry by an addition 31 by 104 feet.

J. T. Carmody, Cedar Rapids, Iowa, will erect a foundry building, 40 x 130, at a cost of about $7,000. The structure will also accommodate a part of the machine shop.

The Lobdell Car Wheel Company, of Wilmington, Del., will erect an addition to its foundry at a cost of $2,800. It will be erected by the American Bridge Company.

John W. Walker has purchased the brass foundry of George T. Allamby, at Bangor, Me.

Pierce, Butler & Pierce Mfg. Co., of Syracuse, N. Y., are just completing plans and specifications for a large addition to their factory. The new building will be attached to the main foundry and the plans will call for a structure 300 feet long and 100 feet wide. It is to be an iron covered building and will be used for the manufacture of boilers and radiators.

The Valley Iron Works, of St. Paul, Minn., will build an addition to its foundry.

The Barr Pumping Engine Co., of Philadelphia, Pa., has plans completed for extensive improvements to its plant. The new plant will include a machine shop, 50 x 250 feet, three stories high; an erecting shop, 80 x 130 feet and 60 feet high, and a three-story office building. The present machine and erecting shops will be converted into an iron and brass foundry. All these buildings are to be equipped with the most modern appliances, cranes, etc., and every facility utilized for the best and economical handling of materials.

G. A. Crosby & Co., of Sarnia, Ont., have been incorporated under Canadia 1 laws with a capital of $600,000, for the purpose of carrying on a general foundry and machine shop business.

The Ideal Stove & Foundry Co., of Daleville, Ind., is erecting an addition which will accommodate 25 molders.

The Baltimore Shipbuilding and Dry Dock Co. succeed to the business formerly conducted by the Columbian Iron Works and Dry Dock Co. of Baltimore, Md.

Master Mechanic Bullock of the L. & A. Railroad has started a brass foundry at Richmond, Ky.

The Mountain City Stove & Mfg. Co., of Chattanooga, Tenn., have let the contract for a new foundry building.

The Mahoning Foundry & Machine Co., of Youngstown, O., will increase its capital stock from $25,000 to $100,000.

R. McDougall & Co. are building a new foundry at Galt, Ont.

The Arthur Fritsch Foundry & Machine Co., of St. Louis, Mo., have increased their capital

stock from $24,000 to $50,000 for the purpose of increasing their capacity to meet the heavy and steady demand for mining machinery. The officers are Arthur Fritsch, president; Edward A. Gessler, treasurer, and Ferd. H. Regel, secretary. Charles Weber is superintendent.

The Navy Department awarded a contract for the construction of a new coppersmith shop and foundry at the Philadelphia Navy Yard to L. L. Leach & Son, of Chicago, at their bid of $83,000.

Edward P. Cooper has been appointed manager of the Anniston, Ala., plant of the Central Foundry Co.

The Pyott Foundry Co., 76 North Sangamon street, Chicago, have recently improved their plant by the erection of a two-story addition 75 x 120 feet, and by the installation of new equipment, including two cranes.

The Sargent Co., Chicago, recently held an election of officers which resulted as follows: George M. Sargent, chairman Board of Directors; W. D. Sargent, president; H. K. Gilbert, vice-president and treasurer, and Day McBirney, secretary. The company are planning a considerable extension to their works at Chicago Heights, Ill.

The Miller Mfg. Co., Ellisville, Miss., manufacturers of brass and gray iron castings, mill forgings, etc., are laying the foundations for a new building, 40 x 150 feet, to be used as a foundry and machine shop.

The new works of the Helmick Foundry & Machine Co., at Fairmont, W. Va., are now completed and in active operation. Equipped with new modern tools, the plant is especially adapted for the manufacture of mine cars, tipples, self-oiling car and truck wheels, machinery, castings, etc., orders for which the company are now prepared to fill.

The Featherstone Foundry & Machine Co., Chicago avenue and Halsted street, Chicago, have again enlarged their foundry. They have just received a large order for dredge machinery from Puget Sound, and with the contracts on hand they will be forced to work overtime.

The Wm. Ferguson Foundry Co., Hawthorne and Willow streets, Chicago, have recently installed a larger engine and have equipped their foundry with new tools, including an electric crane.

Thos. Hewitt's Sons & Co., Sherman Avenue Iron Works, East Newark, N. J., iron, brass and aluminum founders, have incorporated under the style of the Thos. Hewitt's Sons Co. The new company will double the capacity of their present plant, modernizing it throughout with all latest appliances, so as to handle the increased business.

Arrangements have just been completed whereby the Phoenix Foundry Co. and the Liberty Bronze Co., of Pittsburg, Pa., merge their interests under the name of the former company. The Liberty plan will be abandoned and the Phoenix plant enlarged and remodelled, new machinery being added for the purpose of facilitating the handling of much heavier castings than formerly, and for turning out finished brass and bronze of every description, and also aluminum castings. The new organization has for its board of directors the following: A. F. Brown, late manager of the Keystone Bridge Works; John P. Provost, of the R. D. Nuttall Co.; W. J. Ritchey, of Weyman & Bros.; E. C. Chalfant, attorney; John W. Porter, accountant and auditor, and Robert McMillan, who has been at the head of the Phoenix Co. for the past eighteen months.

J. E. Sweitzer is putting up a foundry at Springfield, Mo.

The Chattanooga Stove Co. has decided to erect an additional foundry 157 by 67 feet.

The Enterprise Foundry Co. has been incorporated at Kansas City, Mo., by James Kershaw, S. Rogers, W. R. Moore and D. B. Henderson.

Geo. Challoner's Sons Co., of Oshkosh, Wis., is building an addition to its foundry.

Walter F. Shattuck of the Art Institute has drawn plans for an addition to the Armour Institute at Chicago, Ill., which is to contain workshops, forge and blacksmith shop, machine shop, pattern and wood-turning shop, and foundry. Mrs. P. D. Armour recently made a gift for the construction and maintenance of this building, which will have 130x100 feet ground dimensions, and cost $50,000.

The Buck Stove and Range Co., of St. Louis, Mo., is completing an addition to its foundry which will increase its capacity fully twenty-five per cent.

The Des Moines Scale & Mfg. Co., Des Moines, Iowa, have purchased a tract of land on which they intend to erect a factory which will give them four times the capacity of their present works. The main building will be 66 x 132 feet and three stories high, with a half basement in addition. It will be built of brick and will be of slow burning construction, and will be used for iron and brass foundries, a machine shop, carpenter shop, assembling room, stock room, etc.

The Northwestern Foundry & Supply Co., Detroit, Mich., are having plans made by their

engineer for a brick factory, 100 x 125, to be constructed on Grand boulevard. It will have composition roof, structural steel work, skylights and steam heat.

Bids are being received for the $100,000 plant for the Detroit branch of the American Radiator Co., Detroit, Mich. The plant will consist of a brick machinery building, 122x300, 34 feet high; warehouse of frame covered with corrugated iron, 242x380, and a sandhouse, 112 x 56. F. Carl Pollmar, 26 Cleland building, architect.

The Seaman-Sleeth Co., operating the Phoenix Roll Works in Pittsburg, are about to make some extensive additions to their plant, which will very largely increase their capacity for the manufacture of rolls, which this concern make exclusively. It is their intention to increase the size of their No. 2 foundry from 150 feet in length to 240 feet. The three 80-ton jib cranes will be replaced by two 60-ton electric traveling cranes, with two 10-ton auxiliary cranes. Two basic open-hearth furnaces will also be added and some large iron working tools installed. When these improvements and additions have been completed the Seaman-Sleeth Co. will have increased their capacity for the making of heavy rolls fully 100 per cent. This concern has been in business in Pittsburg for more than 30 years, and during that time their business has steadily increased. They have confined their attention entirely to the making of rolls.

M. L. Kirn & Bro., of Philadelphia, will build a new brass foundry at 2138 Leithgow St.

The B. F. Sturtevant Co. has recently purchased at Hyde Park, Mass., a tract of land containing about 15 acres and is preparing plans for the erection thereon of a large up to date plant for the manufacture of blowers, engines, motors, forges, heating apparatus, etc. The new plant will be arranged to reduce to a minimum the labor cost of handling material, and will provide for its direct progress through the shop from foundry to shipping room. It will be equipped throughout with new modern tools and labor-saving devices.

Deaths.

H. L. Kirschman, proprietor of the Centerville Iron Works, Centerville, Iowa, died recently of heart trouble, after a prolonged sickness.

Nicholas Brayer, president of the Co-operative Foundry Co. of Rochester, N. Y., died on May 11 at his home in that city. Mr. Brayer was born 72 years ago in France. In 1839 he came with his parents to this country, and early in life learned the trade of iron molding. In 1867, with others, he established the Co-operative Foundry Co. at Rochester, of which corporation he had for many years been the president.

Henry K. Baker, president of the Springfield Foundry Company, Springfield, Mass., died suddenly from heart failure on May 19.

Reuben R. Finch, late vice-president of the Union Stove Works at Peekskill, N. Y., and for nearly fifty years connected with the stove industry, died May 15, aged 72.

Carl Dickmann, for eighteen years superintendent of the Evansville Foundry Association, Evansville, Ind., died June 5 as the result of a stroke of paralysis.

H. Brown, head of the firm of G. Brown and Brothers, iron and brass founders, of Stockton-on-Tees, England, died on May 3, at the age of forty-eight years. He was a grandson of the late Mr. Andrew Brown, who established the works in Portrack Lane, Stockton, over one hundred years ago.

Rufus H. Pratt died at Hartford, Conn., June 2, sixty-eight years old. Mr. Pratt was the founder of the Bell Castings Foundry, of Hartford, and of the Pratt & Cady Company, and in recent years he had been connected with the Johns-Pratt Company, all of Hartford.

Mudding up the Joints.

I would like to say a few words in favor of mudding up the joints of wooden flasks. There are many molders who believe that such a proceeding is time and labor wasted to no purpose. My experience has been, however, that it pays to mud up the seams, especially if the flask is in the least burnt. Many a time I have saved castings which I could not have done without mudding up the joints.

We all know that hot iron will find every space in the mold no matter how small it is. We also know that, when a run-out gets started, the escaping iron increases the size of the opening as it proceeds, and also increases in pressure as the gate is being filled up, making it more and more difficult to stop the leak. On the other hand, if there is a seam of mud all along the joints of such a flask, this will have a tendency to stop the rush of the small stream of iron.

Of course it is not necessary to mud up all boxes, and I only advocate the importance of attending to this matter when it is necessary.

Some ignore it altogether. That is unwise. Too often we expect too much of the material we have to work with, and, rather than to make a new flask when we are pressed for time, we fall back on one of the "old-timers," when that has had its day, under the impression that we can make it do once more. In a case of this kind mudding up the joints is necessary, and will afterwards save considerable worry and, may be, quite a loss.

JOHN B. SHAW.

Ludington, Mich.

Fires.

The plant of the Milwaukee (Wis.) Steel Casting Co. was destroyed recently, entailing a loss of $17,500, partly covered by insurance.

Shantz & Son's foundry, at Berlin, province of Ontario, Can., was damaged by fire last week; loss $4,000.

The pattern room of the Wing-Sayle Foundry Co., of Little Rock, Ark., was damaged by a recent blaze at that place.

The plant of the Humphreys Mfg. Co., at Mansfield, O., was damaged by fire on June 6 to the extent that the manufacture of pumps and enameled goods will be delayed temporarily.

E. Chrichton & Son's foundry at Lethbridge, N. W. Territory, Canada, burned recently.

The plant of the Southern Foundry Supply Co. at Avondale, Ala., was destroyed by fire recently, the loss being from $6,000 to $7,000.

The St. Clair Foundry at Belleville, Ill., burned June 9. Loss $10,000. Insurance $4,500.

The Phoenix Foundry at Leavenworth, Kansas, owned by Michael Burns, was partially destroyed by a recent fire. Estimated loss $3,500.

The Kerrihard Co. at Red Oak, Iowa, had its foundry entirely destroyed. It will be rebuilt at once.

The Des Moines Mfg. Co., Des Moines, Ia., suffered a $3,000 loss in a fire at its foundry.

It Ought to, at 4100.

The Charleston foundry has put in a cupola fan in the north building with a pipe to the smelting furnaces. The increased speed, which is forty-one hundred revolutions per minute, makes an excellent blast.—Charleston (Ill.) Courier.

One of our subscribers is in the market for a complete set of cast iron molds or chills for casting sashweights and would like to correspond with manufacturers of same.

Steel Molders' Wrinkles.

Molders of steel casting have at last overcome the difficulty of keeping cores from fusing with castings, and with the new mixture cores are more readily cleaned out of castings. Owing to the higher temperature at which steel is melted for a cast, over cast iron, the sand cores used in cast iron are not satisfactory. The use of molasses and sour beer for mixing batches of sand for core causes steel molds to become rough where the cores come in contact with the castings.

This is due to the fact that the molasses and beer dry out and the sand glazes or fuses with the metal. In one of the steel casting plants in Pittsburg the coremakers mix common linseed oil with sand. The linseed oil has the faculty of softening the sand of the core. The cleaner has no more difficulty in removing the core from a steel casting than he would in removing a core from an iron casting. The theory is that the linseed oil in the core is fired while the casting is being poured. This burning and release of gases creates a film or space between the casting and the core sand, keeping the two effectually separated. To make a successful job the molder must be careful to make a clear vent from the core to allow a free escape of the gas, otherwise it would be forced back into the mold and create blow holes. About two quarts of linseed oil is mixed with a batch of four bushels of sand. Other oils have been tried but most of these burn out in the drying of the core, whereas linseed oil thickens and forms a gum to which the sand adheres.

This mixture has been successfully used in the making of teeth for spur gears. A set of cores composed of this mixture has resulted in the cleanest castings ever turned out at a steel foundry.—[James B. Hamilton, in American Manufacturer.

Loss of Manganese.

Having charge of several cupolas melting cast iron, I have had considerable trouble through the loss of manganese. We tap from cupola into large bull ladles, which hold about seven tons each. When keeping the ladles about half full, we experienced very good results, but when our ladles are filled to their full capacity of seven tons we are not as fortunate. Is it possible that a chemical reaction takes place and that through it more or less manganese is oxidized in bull ladle? J. J.